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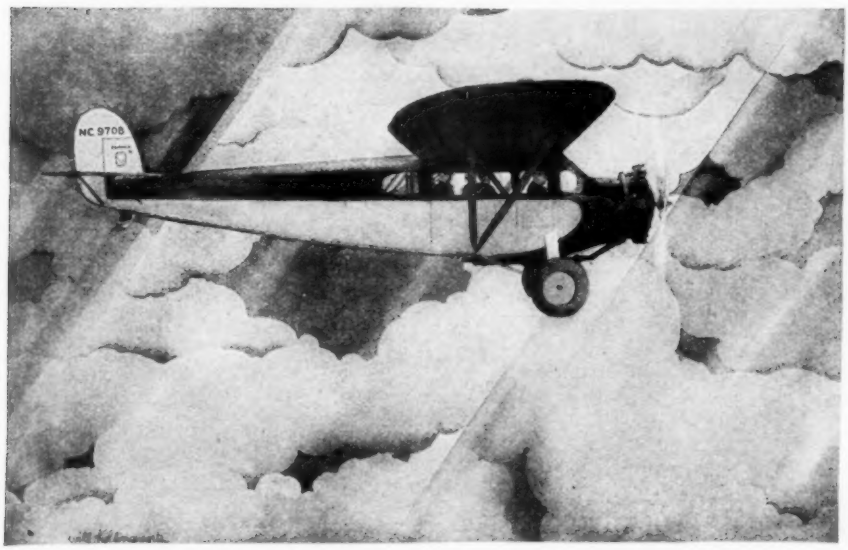

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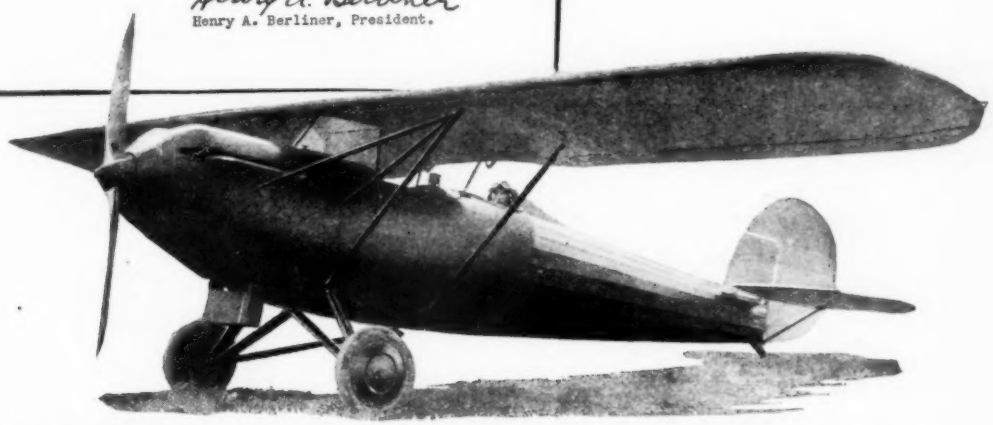

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Frederick B. Rentschler

Frederick B. Rentschler has been elected president of the Aeronautical Chamber of Commerce, succeeding Major Lester D. Gardner. Mr. Rentschler was a captain in the United States Air Service during the war, and is at the present time head of the United Aircraft and Transport Company and the Pratt and Whitney Aircraft Company. From 1920 to 1924 Mr. Rentschler was president of the Wright Aeronautical Corporation. POPULAR AVIATION AND AERONAUTICS, itself a member of the Aeronautical Chamber of Commerce, desires to congratulate Mr. Rentschler upon his election and to wish both the new president and the Chamber a year of achievement.

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Introducing to You—

MR. BERTRAM W. WILLIAMS, who tells of "Freaks That Flew," "leaned against 'em" at Hendon, way back before the war. We have a good one on Mr. Williams. Some months ago we lost Mr. Williams' address and asked our readers to locate him for us. We have to date received nearly twenty letters indicating that Mr. Williams is our most active contributor. Two of our readers bemoaned his death, one of them dating the sad event in 1917, while the others have distributed him, positively, in some eighteen cities, ranging from Portland to Bangor and from Winnipeg to New Orleans. This, in itself, ought to anger a loyal Californian, who undoubtedly visits other states incognito only.

DESPITE his name, Mr. Lamarche is an American, although he boasts a Paris address, when he is not travelling the European air lines. Your editor confesses to an envy of the glib way in which Mr. Lamarche can talk of the schedules of the Sabena, the Cidna, the Sisa, and the other foreign lines.

MR. HANSHUE has one record that is an enviable one. When all the air transport lines in the country were hanging on by their teeth and hoping for the miracle, which did happen one May day in 1927, Mr. Hanshue was operating an air express in a part of the West which the average Easterner couldn't locate and didn't believe would support anything. Besides just operating this line he was making it pay dividends both regularly and handsomely. Record enough, we think.

MR. BEARDSLEY, who is talking shop when he writes of Aerial Photography, is editor of the magazine Photo-Era, and knows whereof he speaks. His next article will go a little further into the subject of amateur air photography, which will please the editor, for he has never taken a good picture on the ground, let alone the waste of film in the air. Some people have the knack.

JOHN GOLDSTROM carries with him, on his way to Oslo, our envious wishes for a wonderful journey. He is going to do North Europe and Russia by air, and his trip will take him across Siberia and through the Orient. May he travel in better comfort than on his first air trip which he describes in this issue. We will hear about this trip later.

LADY HEATH has signified her desire to become a citizen of this country. We know one thing about Lady Heath that we wish to tell our readers—and that is that she is a true friend of the pilots. Checks for her contributions to this magazine go to the Air Mail Pilots' Association. A sweet and friendly gesture.

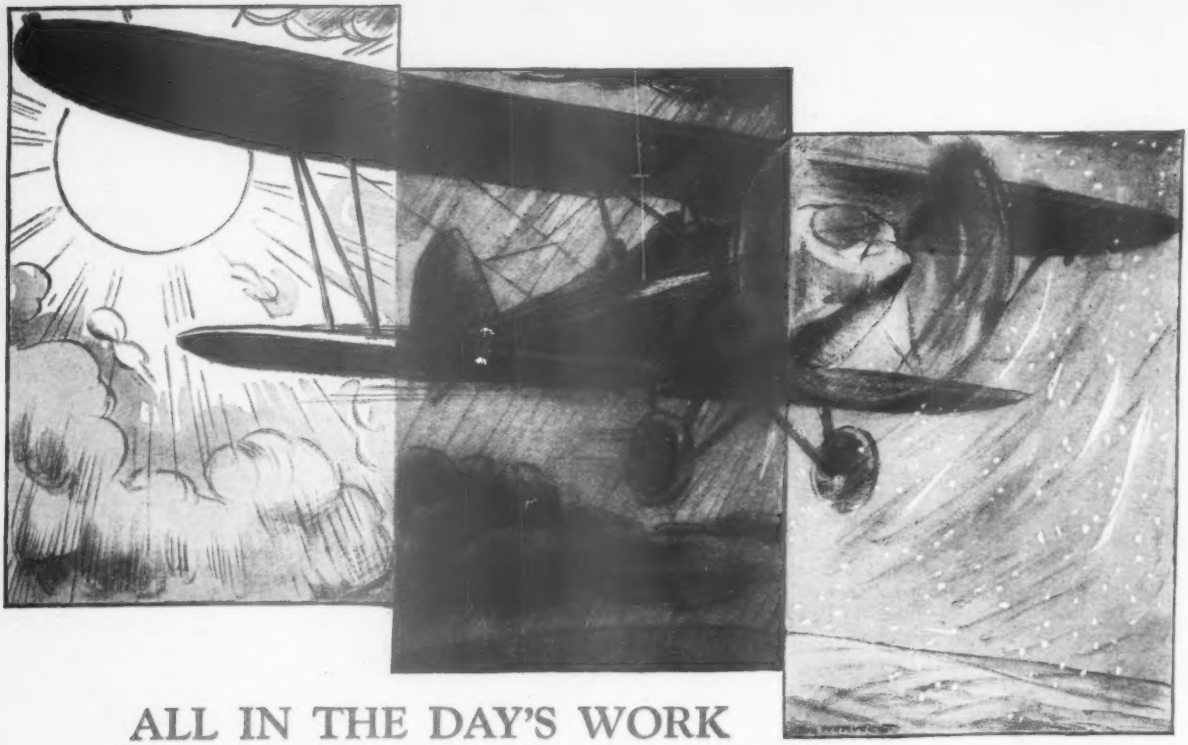
WE remember Major Moseley by the fact that he probably carried the first aerial stowaway. Leaving Las Vegas, years ago when he was a lieutenant in the National Guard, he found his plane flying wing low, and in bad position. Up from a wing skid and onto the wing crawled a "blanket stiff" who thought he had found a quick way to California. He had, but he had the fright of his life, lying there on the wing, digging himself into the fabric—and so did Major Moseley.

THE life of the movie flyer may be a gay one, but a few looks at some of the pictures sent by Lieutenant Robinson convinced us that we have no flair for the films. Just look at the crash on page 48, with the pilot ducking low in the cockpit. Fine—for the other fellow.

COMMANDER JEFFREY'S article did one thing for the staff of Aeronautics. For the first time the principles of navigation became clear. However, we can't help but think that certain men have an inborn aptitude for this sort of thing. There used to be, and may still be today, Gloucester fishermen who could take their craft across the Atlantic with never an observation and make their landfall within a few scant miles. There are pilots like that.

ARCHIBALD BLACK needs no introduction, particularly to the transport operators, who will all be interested in the series he has prepared for us covering the operation of passenger planes. The first will appear next month, and we invite your attention to a more extensive account (on page 19) of what this series will cover.

Harley W. Mitchell



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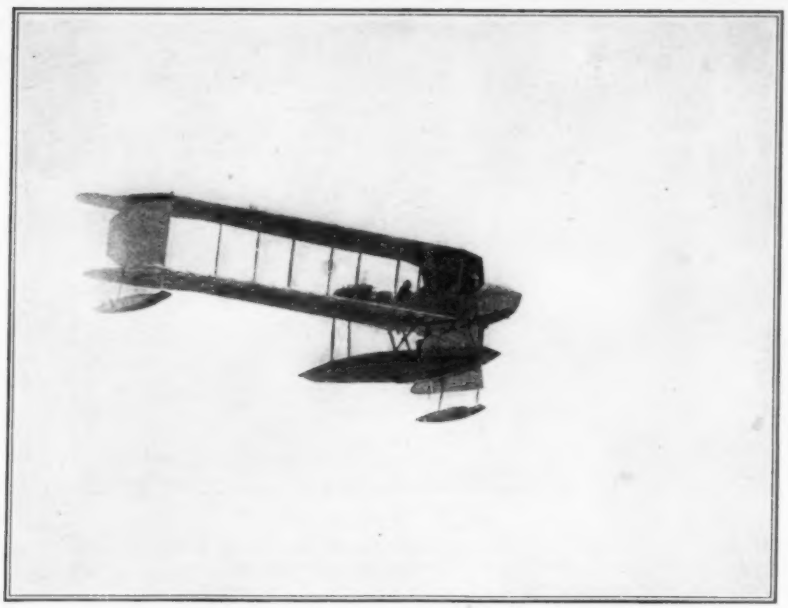


Vincent Astor's Burgess-Dunne Arrow Seaplane off Marblehead, 1914.

Freaks That Flew

By Bertram W. Williams

ALTHOUGH aviation was well advanced from a military point of view all over Europe prior to 1914, the various governments were careful not to encourage standardization among individual aircraft constructors. In the maze of designs submitted and new types constantly being produced they strove valiantly to pick out something that would really come in useful for that delightful European Game—war.

Perhaps it will be news to some people that aeroplanes were employed in military operations in the Balkan-Turkish flare-up of 1912. They were. Bleriot monoplanes did some useful scouting over the Turkish lines on more than one occasion, sufficient at least to prove that these flimsy things of stick and string could be very annoying to an enemy—especially if that enemy had none of his own.

Military leaders the world over and ever since the first caveman hurled a rock at his neighbor have always been distinguished by a lack of imagination. It is doubtful if any of the European war lords expected heavier-than-air machines would serve otherwise than as an aid to reconnaissance work and duties formerly detailed to light cavalry. The idea that an enemy might actually show his objection other than by ground fire to aircraft flying over his private and exclusive territory never entered the heads of even the Potsdam bigwigs. There was much loose talk of bomb-dropping, long distance raids, and so forth, but it was more the bombast of the man in the street than the belief of the graybeards who held the leashes of the war dogs. Yet none of these gentry, military, naval, or civil, were overlooking any bets. When it comes to war or preparing for it, "Hang the expense," that's the motto—in Europe at least.

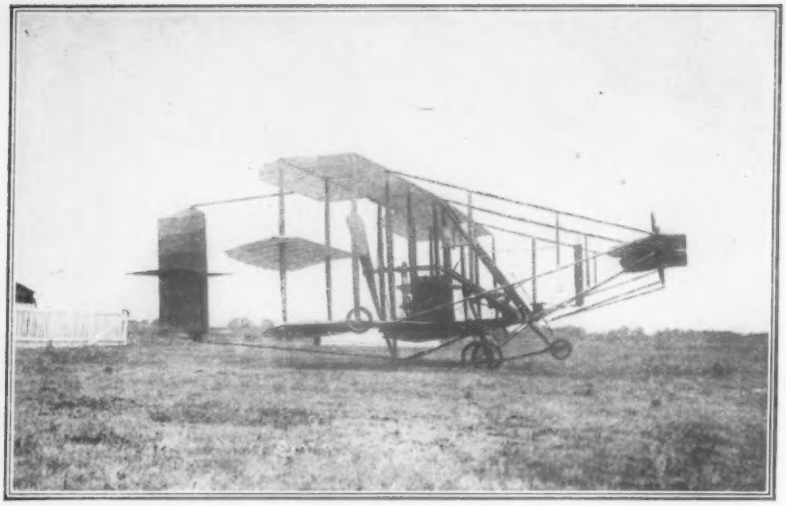
Naturally, the best way of encouraging an inventor is to offer him a worthwhile prize to produce something that will measure up to required specifications. By the end of 1912 there were almost more types of planes being turned out in France, England, Germany, and Holland than there are in those countries today with America thrown in. And they were not all freaks by a long shot. A plane that failed to get off the ground received the loud ha ha then as much as it would now.

The great mass of citizenry in the countries mentioned were, if not exactly "air-minded," keenly interested in aviation. Also the governments of Great Britain and Germany were becoming a little jealous of France's dominancy in this new science. Both in planes and aero engines she was leading. It is no exaggeration to state that the Gnome rotary engine was the greatest boost to aviation since the Kittyhawk flight, though of course the beginnings of man-made wings date before either.

Just as the boy who passes all examinations at school or college often turns out a failure in after life, so the flying machines that answer every requirement of an exacting government do not always show up so successfully as expected. £10,000, I believe, was the sum offered by the War Office at London to the manufacturer of a plane that could fly at a certain speed, climb to a given height, and perform a few mild stunts. And let me tell you, friends, ten thousand quid was quite a piece of change in those days.

Curiously enough, the winner was an American, Samuel F. Cody. Cody, though a civilian, had been connected with the British army for several years prior to 1912, chiefly by his experiments with man-lifting kites, the forerunner of the observation balloon. I saw the prize-taking machine at the Aero Show in London in 1913. It was a weird contrivance, looking as if it had been built out of discarded fishing rods. All the struts and longerons were of bamboo with no attempt at fairing. The pilot sat on an open platform in much the same exposed position as that of the early Wright and Farman "box-kites." Accommodation for the two passengers was on either side of the pilot in the form of iron seats, exact replicas of those to be found on horsedrawn plows and other agricultural implements. Indeed, the whole structure resembled a reaper and binder.

A very short time after the machine had been accepted by the government Cody was killed on it whilst flying with a passenger in a test flight. After that, John Bull was content to rest on his oars a while as far as Britsh-made aircraft



Samuel F. Cody's bamboo biplane which won the British War Ministry's £10,000 prize in 1912.

was concerned and to buy most of his equipment from La Belle France.

Mr. A. V. Roe, the well-known designer of Manchester, was the first to introduce the biplane type with a fuselage body instead of the nacelle and long outriggers. Its advent reduced the number of freak planes and construction followed more or less on standardized lines. Immediately after the appearance of the improved rotary engine Le Rhone, France, began to experiment with small speedy monoplanes which, while beautifully made, took considerable skill to handle.

The Germans, now thoroughly aroused, were convinced at last that the heavier-than-air machine had come to stay and was likely to prove a serious rival to the expensive and unwieldy dirigibles they had been building. Most of their earlier types were extremely clumsy ships powered by enormously heavy engines. Dr. Etrich, an Austrian, invented the Taube (dove) monoplane, so called from the curious and unconventional shape of its wings, which were tapered and held in place by a maze of wires running to cabanes above and below the fuselage. The remarkable feature of this type was that the tips of both wings were turned up at a negative angle of incidence, the idea being that in case of a sideslip the reversed area would offer sufficient resistance to the air to allow the machine to right itself. The disadvantage was that these upturned tips were an enormous drag when the monoplane was flying level.

The Germans discarded the Taubes very shortly after the war started. About 1915 they enlisted the services of a gentleman named Anthony Fokker who taught them quite a lot about efficient aeroplane construction.

But designers all over the world were not satisfied. They were forever experimenting with new wing shapes, arrangement of planes and elevators, though strangely enough little attention was devoted to the actual aerofoil surfaces even after the discovery by M. Bleriot in 1913 that two-thirds of the lifting power of a heavier-than-air machine was derived from the *upper* side of its planes. A great deal of time and labor—designers didn't have much money in those days—was spent in searching for the ultimate in wing-tips. The purely square was, of course, the most economical to build. But the elliptical was proven to be far more efficient than any other shape. Round and diagonal were also tried out. The Germans and Austrians gave some attention to "swept back" wings; but the Pfeil or arrow plane had little to recommend it.

In 1914 certain manufacturers came out with inherent stability ships, a quality gained by placing one or both planes at a dihedral angle to the path of flight. Such machines were not popular with skilled pilots, who claimed they were difficult to handle under certain contingencies.

Of the legion of freaks continually cropping up at the various aerodromes the queerest was the Canard from the workshops of M. Bleriot. This extraordinary apparatus was a monoplane with the tail and control surfaces *in front*. But it flew. The writer has seen it skimming a few feet over the ground with a very young and very scared pilot in charge.

Another unconventional machine that caused considerable excitement in the British newspapers was the one invented by Mr. Dunne in 1913. He had produced something that represented an entirely new theory in aircraft construction. It was an arrow-shaped biplane without any fuselage. Nor were there the usual elevators, stabilizer, or rudder fastened to outriggers. Horizontal and vertical control was effected entirely by working the ailerons, and its designer claimed it was so efficient and steady in the air that it could be flown "hands off." He gave several demonstrations and convinced the lay press at least that at last the much sought for foolproof machine had been discovered.

Contrary to general belief, the Great War did not stimulate aviation to any marked extent. It was no time for any experimentation. Aircraft factories all over the world were rushed with orders, and though of course the performance of machines improved considerably during the four years of hostilities, it was due more to the competition among manufacturers of aero engines than any radical change of design in the aircraft. There were refinements of streamlining and fewer exposed parts to offer parasite resistance; but little else.

(*Continued on page* 84)

A Voisin Canard at Paris, 1910.

Mussolini Pilots Italy

By Paul E. Lamarche, Jr.

IN Italy there are flies and flyers. The flies have always been there and anyone who has been in that country will remember the somewhat complicated nets that surround one's bed at night to keep out the flies and mosquitoes so that those who prefer to sleep during the hours of darkness may enjoy some freedom from the pestiferous and energetic little insects that insist on becoming personal. Italy without her little beasts that sometimes are carnivorous in their habits as they dart from nose to ear and ear to eyebrow and generally all around one's anatomy would be like America without her bootleggers. They are a part of Italy. In the past they made the Caesars itch and the Borgias scratch and even now they make the Italian population and their visitors feel their presence. Signor Mussolini, who is responsible for everything in the bigger and better Italy is not responsible for the flies for despite his best efforts Italy will continue to have her insectae.

Europe Takes Notice

Signor Mussolini is, however, responsible for Italy's flyers and having assumed this responsibility he has built up a military and civil aviation within the past few years that has caused the rest of Europe to take notice and wonder what is going on in the boot. We know Signor Benito Mussolini as a dynamic character and one who is able to get things done and his accomplishments since assuming the dictatorship have lifted this land, where they eat their spaghetti with chianti and music from the chaos of bad times after the war, to the status of a very progressive nation.

Two Years' Effort

Not so long ago Italian aviation barely existed and prior to 1926 there was no such thing as commercial aviation to be found in this country. A small military air force with poor and inadequate equipment represented their air development and it could hardly be said that this force caused any uneasiness among their neighboring countries since their appearance in the Italian skies was not, perhaps, as formidable as the forces of their more bellicose neighbors. But Il Duce was enthusiastic about flying just as he is tremendously enthusiastic about the business of running his country and he let it be known that Italy must have aviation in a big way. As everyone who has followed the political affairs of Italy knows, when Signor Benito decides to do a thing it is done and in the case of aviation Mussolini has put Italy in the air in typical Mussolini fashion.

It has been said that Mussolini runs the air services in Italy in much the same manner as General Mitchell tried to bring about in our country and in many respects this is true. The air services are divorced from the army and navy and operate as separate units of each while the civil aviation forms another branch of the air service. At present the Italian air service personnel consists of a Commissioner of Aeronautics who is Mussolini himself. Under him is an Assistant Commissioner who has active control of all aeronautics while immediately under him in turn is the General Bureau of Military Aeronautics and the General Bureau of Civil Aeronautics. It is the purpose of Italy's Iron Man to have the management of the air services handled by as few people as possible and this system has already proved to be efficient and has produced results that other nations have not been able to achieve because of the entanglements of red tape and petty politics that block the efforts of supporters of aviation.

Spectacular Evidence

Mussolini is very much in earnest in everything he does and with aviation the world has seen evidence of this in a big way. The flights of de Pinedo, Locatelli, Nobile, del Prete, Ferrarin, di Bernardi and others at his instigation during the past few years have shown to the rest of the world that he is out to put Italy in the skies and this is fast being accomplished. Within recent years Italy has gained possession of eight world's records which she now holds. Her military aviation is efficient and well trained and the equipment used is the most modern. Her two 20,000 ton cruisers, the Cavour and the Cesare have catapults for flying boats, the two 10,000 ton cruisers Trento and Trieste are equipped to carry and launch seaplanes, while similar equipment will be installed on two new cruisers of this tonnage that are in the course of construction. Her commercial air lines, which started from nothing in 1926, have spread out in all directions and daily carry their passengers over the Alps, the Mediterranean, the Adriatic, the Ionian Sea and other territorial boundaries in the maintenance of their schedules.

All of which is very praiseworthy, but let us go into some detail about the commercial air lines which Signor Benito has caused to operate. There are in Italy now a number of companies engaged in the exploitation of services that carry passengers, mails and freight. Among

the principal of these are the Società Italiana Servizi whose headquarters are at Portorose on the Adriatic, the Società Anonima Navigazione Aerea of Genoa, the Società Anonima Italiana di Navigazione Aerea, which short winded Italians prefer to call the Transadriatica Line and whose headquarters are in Venice. There is also the Società Anonima Aero Espresso Italiana of Rome, the Avio Linee Italiane also of the Eternal City and the Società Aerea Mediterranea whose headquarters are likewise in Rome. Admittedly it is as hard to read these names as it is to pronounce them and one usually refers to these companies in Italy by words composed of the first letters of their names.

The comfortable interior of a trimotor Junkers of the Transadriatica Line.

As is the case of most of the European countries who go in for commercial aviation in a big way, the Italian lines are backed by government subsidies and in order to obtain the necessary results the Italian government has subsidized these lines generously. The air estimates for 1928-29, which ends with June of this year, includes an expenditure of 24,976,000 lire for pay and allowances of the civil aviation personnel while civil and general aviation will benefit to the extent of 113,085,000 lire from the government's pocket book. The air budget for 1929-30 covering all Italian aviation will be 700,000,000 lire which when translated into our currency amounts to almost $37,000,000. When the relative low cost of labor and materials in Italy are considered this appropriation has a greater value than it may seem at first and it shows that aeronautics in the land of the Romans has the backing and support of an air minded government.

When Italy inaugurated her first commercial air lines in 1926, she was able to benefit by the experiences of other nations in Europe who have been operating air lines for periods of from five to eight years and studied their operation closely. The equipment used on the Italian lines, which is largely of foreign conception, is the result of selections made from such observations and they have some of the most modern flying stock available on their international routes. In 1927 there were but two international lines operated by Italian interests and today there are a number of them radiating in many directions from her principal airports. As one knows, much of the interior of Italy and especially to the north, is mountainous and rough country. There are several lines operating over the Alps and the Appenines in the direction of Germany and Austria but most of Italy's air lines are over water and follow the coast lines since many of her principal cities such as Rome, Genoa, Naples, Venice and others are situated on or near the sea and as a result flying boats of various types are used on most of the commercial routes.

Commerce in Ascendancy

The growth of commercial aviation in Italy since their initial year is well illustrated by a few figures. In 1926, their first year of civil aviation, the number of kilometres flown was 523,122, the total number of passengers 5,142 and the total weight of freight and postal matter amounted to 46,470,043 kilograms which is rather a good beginning. In 1927 the corresponding figures were: 1,327,557 kilometres flown, 12,506 passengers carried and 141,570,088 kilograms of mail and freight. During 1928 these figures grew to 1,991,809 kilometres flown while 15,590 passengers were carried together with 249,036,000 kilograms of freight and mails. Which all goes to show that Italian aviation is very much in the ascendancy and this year is certain to see a much greater increase in the use of the commercial air lines especially since several new lines will be in their first year of operation. However, let's have a look at each of the important air companies separately to see what it is all about in Mussoliniland.

The SISA Line

We have the Società Italiana Servizi Aerei, which for your sake and the writer's we shall refer to as the SISA Line, as it is known in Italy. This company was established on April 1, 1926, and has its headquarters at Portorose. They fly between Portorose-Trieste-Zara-Ancona and Venice over the Adriatic daily and form a liaison between Italian cities and Zara in Yugoslavia. The Venice-Trieste-Zara Line began to function in October of 1926 while the extension to Ancona is the most recent. The SISA Trieste-Vienna Line during December of 1928 made 84 trips operating with 100% regularity and covered a distance of 11,535 kilometres carrying 111 passengers. Between Trieste and Zara 80 trips covering a distance of 15,074 kilometres were completed during this time while they carried 114 passengers as well as baggage and mails. In the preceding month these two lines made respectively 121 and 103 trips each operating with maximum regularity during a busier part of the season. The planes used by the SISA Line are four passenger cabin flying boats known as Cant 10ter, the name being derived from the name of their constructors, the Cantiere Navale Triestino, of Trieste, who also build various types of flying boats for the naval flying. The Cant 10ter is usually equipped with an Isotta Fraschini 500 H.P. "Asso" motor that works as a pusher. French Lorraine motors are also used on these flying boats for there are many foreign motors used by the Italian air services. This commercial type of flying boat has a maximum speed of 124 m.p.h. and a cruising speed of 99 m.p.h. while its ceiling is rated as 13,120 feet. The span is 47 feet 4 inches and the length 33 feet 8 inches. A larger fiying boat equipped with three motors, two pusher and one tractor, known as the Cant 22, has been built by this company to accommodate twelve passengers.

The SANA Lines

What is now one of the longest over water air routes and one of the most important of the Italian transport companies is the Società Anonima Navigazione Aerea of Genoa, which is popularly

known as the SANA. The SANA started flying their planes up and down the west coast of Italy between Genoa-Rome-Naples and Palermo in April of 1926 and was quick to gain favor with the travelling public. It is particularly convenient for those travelling south since passengers can make connections with the steamers of the Sitmar Line at Naples for Egypt and as there are a number of wealthy Italians living there this line enjoys considerable of their patronage. In flying north from the South of Italy this line enables connections with the De Luxe trains to Paris to be made at Rome. The route between Genova, as they call it, and Palermo is an interesting one to fly over. The planes start south from the seaplane station known as the Idroscalo Vittorio Emanuel III at Genoa and pass close to Pisa so that the famous leaning tower is plainly visible. After flying over the coast line past the fertile fields of Tuscany, the Island of Elba, Napoleon's exile, is passed and after three hours the plane lands at the airport known as Ostia Fiumara of Rome. Continuing on, the plane flies to Naples affording the air travellers a splendid view of Vesuvius and the Island of Capri. From here the plane wings its way on to Palermo and after three hours of flying along the coast of the South of Italy the passengers alight at the landing stage of the airport known as Santa Lucia. The distance between the home port of Genoa and Palermo is 1,070 kilometres which amounts to approximately 675 miles. From January 1st to December 31st of 1927 SANA covered a distance of 367,910 kilometres or about 229,940 miles and carried 3,387 passengers, 2,457 kgs. of mail and 44,353 kgs. of freight which is not bad business for a year old line.

But this is not all. During the last year SANA has expanded extensively in the Mediterranean and their service now includes lines between Rome-Genoa and Barcelona as well as Rome-Syracuse and Tripoli, the second mentioned having been opened on the first of November of 1928. SANA will operate this Tripoli line in conjunction with the Imperial Airways of England who are shortly to inaugurate their London to Karachi Empire line. It is now the aim of SANA to prolong their Barcelona line to Gibraltar so that passengers arriving from New York on the steamers of the Lloyd-Sabaudo Line will be able to continue by air from that point to Genoa which will reduce the time of the trip from New York to seven days. Eventually the Barcelona connection will be a part of a Mediterranean circuit since lines to the Balearic Islands, Sardinia and thence to Rome will be put into operation.

Mechanical Equipment

The planes used on the SANA lines are Dornier Wal and Super-Wal flying boats which are built under license by the Società di Construzioni Meccaniche Aeronautiche at Marina di Pisa. Most readers are familiar with the characteristics of the Dornier flying boats and those built in Italy are identical with the German built ships. The Wal boats are powered with two Rolls-Royce motors while the Super-Wals are driven by four Rhone-Gnome-Jupiter motors. These big Super-Wal boats carry twenty passengers and a crew of four and have a cruising radius of 2,000 kilometres. They are splendidly appointed ships and their wireless equipment, unlike that on most commercial aircraft in Europe, can be used when the plane is at rest on the water since it is not dependent on a wind driven generator.

The Società Anonima Aero Espresso Italiana of Rome operates a line between Brindisi-Athens and Constantinople using for the most part Dornier flying boats although their fleet also includes Savoia 55's powered by two Lorraine 400 h.p. motors and Macchi 24 boats powered by Isotta Fraschini 500 h.p. "Asso" motors. This company was one of the first international lines to be established in Italy, having inaugurated their service by-weekly to Constantinople in August of 1926. The distance between Brindisi and Constantinople, which takes the travellers over the Strait of Otrante, the Ionian Sea, the Gulf of Corinth, the Ægean Sea and the Sea of Marmora is 1,437 kilometres or about 895 miles. From May to December of 1927 this line operating bi-weekly flew a distance of 193,170 kilometres and transported 470 passengers, 1,213 kgs. of mail as well as 22,695 kgs. of freight. While the writer has not the figures for 1928 available there was a considerable increase in air traffic over this line during the past year.

The Transadriatica Line, whose official name has already been mentioned, has its headquarters in Venice and operates its fleet of Junkers planes between Rome-Venice and Vienna direct in conjunction with the service of the Oesterreichische Luftverkehr Allegemeine Gesellschaft, which is what the Austrians have named their line that flies Junkers over the mountains to the city of canals. Both of these air transport companies operate also on certain days of the week over the same route with intermediate stops at Gratz and Klagenfurth. The G-23 Junkers propelled by three German B.M.W. motors each are used on the direct service while smaller F-13 Junkers are used on the short distance routes. Transadriatica began flying customers across the Alps in August of 1926 but did not operate on the entire route until February of 1927. The dis-

(*Cont'd on page* 92)

We're not quite sure where the photographer stood, but it's a nice picture anyway, and shows what you may expect if you take this trip in Italy.

Financing Air Transport Lines

By Harris M. Hanshue

President, American Air Transport Association

FORTY months ago it would have proved very difficult to persuade anyone to place his funds in any sort of aeronautical venture. How the picture has changed! It is even more difficult to prevent universal dissipation of hard-earned savings through injudicious buying of all kinds of aeronautical securities.

This reversal in the public attitude toward aviation not long ago brought the aeronautical industry abruptly to a crisis in its development. It may either yield to the general hysteria and, by flooding the nation with offerings of little or no value, take toll in millions of dollars in easy winnings from the unwise and unwary; or it may set its face sternly against such practice and, placing future prosperity ahead of immediate profits, undertake the establishment of only such projects as are basically sound. Business men in aviation should be concerned with the effects of these alternate courses upon the industry and their decision should favor that course which will pay out best in the long run.

Promoter-Profits Only

Pursuance of a policy of overcapitalization, stock manipulation, paper promotions and unsound projects merely to reap an early harvest from the inordinate and unstudied demand for aeronautical issues can work only hardship and disaster, both to the public and to the industry, and bring the latter into such ill repute and under such suspicion as will retard its healthy growth and tend to destroy its present sound structure. Profits thus gained will accrue only to the promoter and the manipulator at the expense of the public and the industry. The collapse of these promotions will leave the public chary of financing sound operations and place the industry under a handicap from which it may never fully recover.

The Banker's Part

On the other hand, the launching of sound enterprises carefully surveyed in advance and financed, installed and managed economically with a view to producing an article or a service of value commensurate to its cost will intrench aviation behind a bulwark of rectitude and public confidence that will make its healthy development increasingly profitable.

The investment banker can play a large part in determining what the final choice will be; and selfish interest should dictate his siding with the latter course. To sponsor an aeronautical issue merely because customers are clamoring for such stocks is not the part of wisdom. To impoverish customers for the sake of a single easy commission is hardly as profitable as guiding their investments in such ways as will increase their capital, stimulate their buying capacity and assure frequent commissions on a wholesome basis of fair fees for honest service rendered.

In order to fully protect his clients the investment banker, of course, must have some criterion by which to judge the projects brought to him for financing. Each phase of aeronautics obviously will require a separate gauge, insofar as the marketability of the product is concerned. Airplanes or airplane engines, instruments, accessories and airway and airport equipment all have markets that are more or less determinable. But, as to any particular airplane or device it is impossible to establish in advance what the demand will be or how long it will last. This, because of the state of flux of the entire aeronautical industry and the rapidity with which marked improvements and revolutionary advances are occurring.

Rapid Transit for Sale

With air transportation, however, the problem is not quite so involved. In this special field the product manufactured is rapid transit. The plant consists of airplanes and airplane equipment immediately available and the cost of operating which can be readily approximated. The use of the service rendered may be determined fairly accurately by careful study of the traffic flow over a given route with regard to the amount of this volume that may reasonably be diverted to the air carrier at rates sufficiently high to return a profit.

It is highly desirable both from the standpoint of the public and of the aeronautical industry to avoid overcapitalization and of exercising economy in the financing, installation and management

(*Continued on page* 90)

Popular Aerial Photography

By A. H. Beardsley

Editor, "Photo-Era"

Commander M. R. Pierce testing out the most complicated of aerial cameras—the new sextant camera built for Commander Byrd.

THERE is a steadily growing interest in aerial photography on the part of the general public. Based on my personal observations and experiences as editor of an internationally known photographic magazine, I believe that photography from the air will become as popular with owners of cameras as it is now on land and sea. In my opinion, it is no more hazardous to make pictures from an airplane than it is from speeding railroad-trains, dashing speedboats or dizzy mountain-peaks. In fact, one takes no greater chance in the air than one does in driving a motor-car on a crowded highway on a Sunday afternoon. Personally, I feel safer in the air with a good ship and a reliable pilot. Nevertheless, there are still many who fear to leave the ground, much less take cameras with them and make pictures. In the hope of dispelling some of these fears, let me try to record some of my own photographic adventures in the air. I believe that I may be considered to represent the average owner of a camera who decides to take a flight. It is my hope that in reading of my experiences and reactions the reader of this article will find the answer to many questions.

My First Air Experience

My first introduction to aerial photography came as part of my military training as a Captain, Signal Corps, Reserve. I was assigned to the Photographic Section of the Signal Corps and my annual training for the past few years has included ground and aerial photography. The U. S. Air Corps maintains its technical photographic school at Chanute Field, Rantoul, Illinois. One of my training periods was spent at this school, and there I received my first experience in the air. The reader may raise the question that for this reason my experience does not truly represent the average owner of a camera. Just one moment, please. Let me tell my story before making any decision with regard to whether or not I was on any different footing than the average amateur photographer.

According to my orders I was to report to Chanute Field as a Signal Corps Officer and not as an Air Corps Officer. I was to study the general methods of photographic instruction, attend lectures and otherwise profit by the splendid facilities which this Army school offers. I had absolutely no thought of flying, nor did I expect that I should be required to do so. In fact, I reported for duty with a feeling of security that my duty would not call me off the ground. Before leaving my home, I assured relatives and friends that they need have no worry about me at all. I was a Signal Corps Officer and, as such, my feet would remain on terra firma. Any lurking fear that I might have to fly was dispelled as the days passed and my routine of lectures and laboratory instruction continued uninterrupted by the slightest intimation that I was or would be expected to fly. I was well content with things as they were. I was safe, taking no chances, and the prospects of my returning home seemed assured.

Then, I received one of the greatest shocks of my life. One morning I received orders to report to the Medical Officer for a physical examination preparatory to flying. In the U. S. Army, orders are orders. I had no opportunity to decide whether I would accept or reject the invitation. Frankly, my knees seemed to shake under me. On the way to the Medical Officer I hoped earnestly that he would find something wrong with me so that I would not be permitted to leave the ground. No such luck. He pronounced me perfectly fit. Next I was ordered to report to the Quartermaster Officer for my flying equipment and then to one of the hangars where I could hear a DH photographic ship being warmed up. When I arrived at the hangar, the officer who was to be my instructor and pilot greeted me with a cordial smile, such as a cat might assume upon getting a nice fat mouse in its clutches.

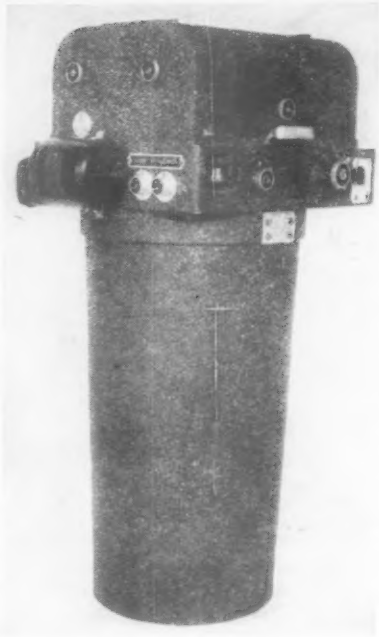
"Ever been up before?" he asked pointedly. When I answered in the negative, he again smiled cordially, as did some of the enlisted men who were getting things ready. Everyone was so very pleasant about it that my knees shook more than ever. Finally, they wheeled the ship around into the wind and my instructor took me aside for a few parting words. He told me to hold on tight, not look over the side too much; and, if I began to feel sick, to wave my arm which he could see reflected in his instrument-board. He would then descend as quickly as possible. He then climbed aboard, while one of the enlisted men fitted a parachute to me, helped me into the rear cockpit and then fastened the safety belt around me. I felt like a man in a straight jacket being made ready for his execution. My pilot looked around to see if I was ready. I signalled weakly that I was. He gave the gun to the twelve cylinder Liberty which responded with a roar and a rush of wind which took my breath away, and I felt the ship lurch and bump ahead. Then the bumping stopped and a hurried glance over the side showed that we were off the ground. I hung on tightly, not daring to do anything else. Up we climbed and circled back over the field. Another hurried glance over the side showed the hangars far below and about the size of little dog houses. My pilot then headed off toward Champaign, Ill., where the University of Illinois is situated. As we flew along on an even keel and nothing

seemed to happen, I took a chance and moved a little in my seat. Still nothing happened. Then I braved the blast of the Liberty and had a good look over the side. Far below, the shadow of the ship followed us along across the farmlands of Illinois. It was a wonderful day with beautiful clouds in the sky and we were sailing along about one hundred miles an hour. Still nothing happened. I began to relax in my seat. I let go with one hand so that I could look over the side some more. I was beginning to get a thrill out of the experience. Then my pilot suddenly turned his head and waved his arm to ask if I was all right. I signalled back with far more pleasure than I did a short time ago. Indeed, I was all right and getting a tremendous kick out of the first flight of my life. When we reached the great stadium of the University of Illinois, he banked sharply to swing around it. For a moment my knees shook again; but when the ship gracefully came back to an even keel and headed back toward Chanute Field my confidence returned, and has never left me from that day to this. The trip back was a delight and I enjoyed every single minute of it.

Evidently my behavior on my first flight was encouraging enough to my instructor to warrant his suggesting another flight, this time with a camera. I was told to report to the Sergeant in charge of the camera stockroom and be shown how to manipulate an aerial camera which, although now obsolete in active service, is still used for training-purposes. It was made of metal, had grips on each side of it, employed a focal-plane shutter and used 4 x 5 glass plates in a magazine. On top of it was a direct view-finder through which one was supposed to take sight. The equipment was rather heavy and, to me, seemed unwieldy. However, I was not at Chanute Field to select my equipment, I was there to do as I was told. After manipulating the camera as I was supposed to do in the air, the magazine was filled with plates and I was ready for my first taste of aerial photography.

Not So Easy!

Before leaving the ground, my instructor and I agreed on a number of signals. When he spied some landmark, such as a bridge, a large set of farm-buildings or a railroad-station, he was to shake the ship a little and then point to the object to be photographed. I was then to stand up, get my camera ready while he flew once around the object and then came back to a position so that the sun would be at my back. He would see to it that we were at the correct elevation for the focal length of the lens in my camera. When he reached the right spot, he would throttle down the engine, to reduce vibration, and hold the ship as steady as he could for about eight seconds, during which time I was to make the picture, then wave my arm and sit down, while he gave her the gun and regained the elevation he had lost.



The Fairchild K-3 Aerial Camera.

As I climbed aboard the DH, I did so with a real feeling of anticipation. I even strapped myself in, arranged things in the cockpit to suit myself and was eager to be off on our mission. With a roar we started away and soon were following the main line of the Illinois Central Railroad in quest of a roundhouse. Before long one came in sight and my instructor shook the ship, pointed and swung around as we had agreed to do. When the moment arrived for me to make the picture, I tried to stand up; but my life belt held me down to a squatting position. I raised the camera; and, as it received the full blast of air I thought it would be torn from my hands. I tried to get the roundhouse in the direct view-finder; but could not do it. Once I thought that I was going over the side as I struggled to get the camera pointed on the roundhouse. In desperation, I pressed the shutter-lever, waved my arm; and, as the instructor gave her the gun, I literally fell back into the seat with such force that I thought I would go through the bottom of the ship. So this was aerial photography! My legs ached, my back ached, my arms ached, and I knew that I had failed to get my picture. Before I had further opportunity to think things over, the ship shook again and the instructor was pointing to a bridge. I was determined to get that bridge if I fell out in the attempt. I unhooked my life-belt and stood up full length with the result that I seemed to be more out of the ship than in it. However, I was more comfortable on my feet and could balance myself better with the movement of the ship. Again that blast of wind tried to tear the camera from my grasp; but I braced as best I could. When we came into position, I gave up trying to get the bridge in the finder and sighted across the top of the camera. I was very careful to avoid including either the wing or the tail in the picture-area and pressed the shutter-release. Before I waved my arm, I got all set for the speeding upward of the ship; and, when I did signal, I slid back into my seat without even a bump. There, that was better! Aerial photography was not so bad after all. That morning we made twelve pictures; and, by the time I had used up all my plates, I began to feel quite at home. I felt less tension and thought more of getting the picture than of the possibility of falling out while handling the camera. As we turned back to the field I felt as though I were really an aerial photographer.

Love's Labor Lost

However, when the plates were developed I decided very quickly that I was very far from being one. It would require more than an expert to decipher what I had photographed. In cases where the subject could be made out at all, it looked as though a terrific hurricane were raging and the buildings were sailing through space in all manner of grotesque positions. I ached from head to foot; and, on top of that, to get nothing, was enough to discourage any man from further efforts. However, my instructor only laughed, told me to keep up my courage and promised me that on my next trip I should have a nice Fairchild Aerial Camera to play with. Worse and more of it! What could I do with a Fairchild when I could not even get a recognizable picture with the simplest aerial camera at Chanute Field!

I was given a day or two off from flying to get over my mental and physical aches and pains. Then I was given instruction in the manipulation of the Fairchild camera. Truly, it was a wonderful outfit and I thoroughly enjoyed learning how to use it. When the time came to go up with it, I did so very humbly and without any idea that I was an aerial photographer. My one thought was to make good, if I possibly could. One great advantage of the Fairchild was that it was mounted in a sort of shock-absorbing mount which was securely fastened to the ship and there was no need to worry about the camera being blown away. The same procedure in the air was adopted as before, and an

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entire morning was devoted to making pictures. With the camera held securely in its mount—which could be swung around as required—there was less strain and greater opportunity to pay close attention to getting the object properly centered. This trip was one of the most enjoyable of them all, as on our way back we flew up into great cloud-masses and the effects were wonderfully beautiful.

Small Cameras, Too

Aero film, such as is used in the best aerial cameras, must be developed in total darkness and I spent some anxious moments in the darkroom while my film was being developed. When I finally had a look at the negatives, I was glad to find that I had obtained some recognizable pictures, several of which were considered satisfactory by my instructor. Apparently, I had caught the idea of handling the camera; but I was still rather weak in catching just the right point of view for the best effect. All of which convinced me that for serious aerial photography one must use equipment which is especially designed for the work. Subsequent trips helped me to improve my work; and just when I began to feel that I was beginning to accomplish something, my tour of active duty came to an end.

While at Chanute Field I used a Graflex and a little vest-pocket camera. The latter I took with me on several flights, for experimental purposes, and succeeded in making a number of very fair pictures with it. This convinced me that ordinary amateur cameras could be used in the air, provided due precautions were taken to protect them from the wind-pressure and the right shutter-speed was used. Since then I have been studying the matter with considerable interest and I am led to believe that the day is not far distant when amateur aerial cameras will be made by the leading manufacturers which can be used as easily as the ordinary type of camera now so common among vacationists. I have made some flights aside from those in my military training; but as yet none in the de luxe cabin ships which are now becoming so numerous on the commercial routes. For the present it seems to me that the best photographic results are still to be obtained from open cockpit ships, provided adequate protection can be given the camera.

Next Month

It has not been my intention to intrude my personal experiences in these notes; but it seemed that perhaps in doing so I have prepared the way for a more detailed treatment of the actual handling of amateur cameras in the air. Let me make it clear that my experience need not necessarily be that of those who would like to make pictures from an airplane. Ships and methods are being constantly improved. In my next article I shall attempt to tell the average owner of a camera how he may make pictures from the air with a reasonable assurance of success. There is a real thrill in aerial photography for those who try it.

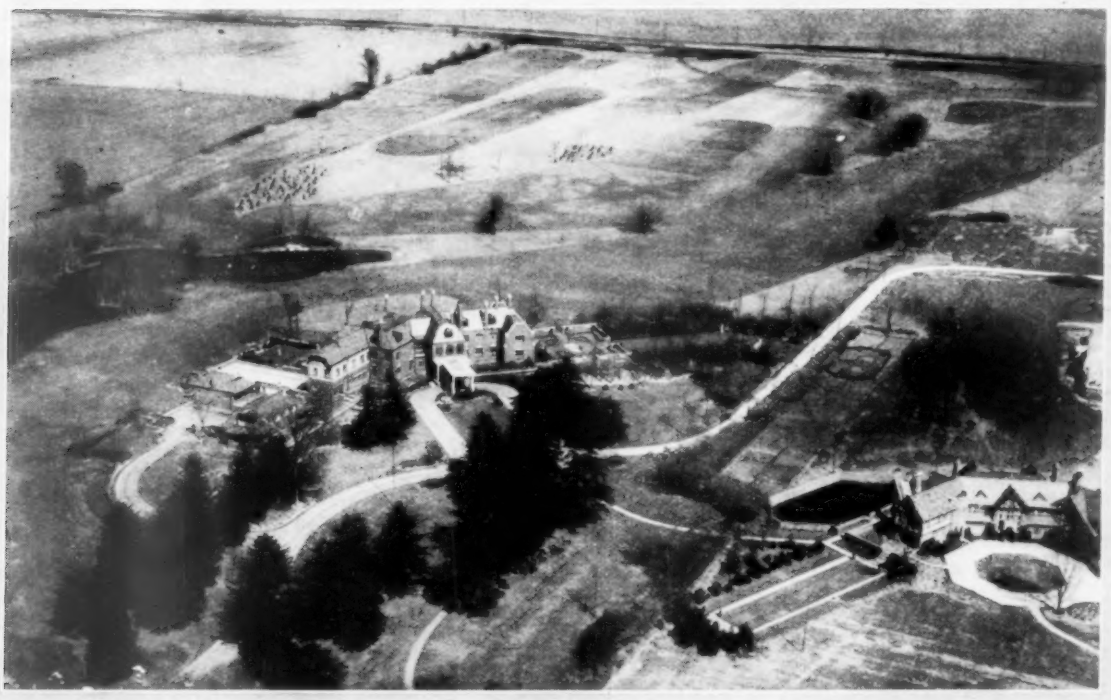
Attention, Operators!

Next month Aeronautics will publish the first of a series of three articles on Airplane Operations by Archibald Black and George F. Wheeler. This is the first analysis ever made of large scale operations with five, ten and eighteen passenger planes.

The conclusions of Mr. Black and Mr. Wheeler in this analysis are of great interest, especially to operators of transport lines, particularly since the tables of costs have been worked out with great particularity.

The firm of Black & Bigelow, of which Mr. Black is president, was commissioned by this magazine to make these analyses, because of its reputation for accuracy and its wide knowledge of the aviation industry. Mr. Wheeler, who collaborated with Mr. Black is in the Industrial Investigations Division of Black & Bigelow.

Operators desiring advance copies of the articles may have them by addressing the editor.



An Illinois Country Club from the air.

The author, John Goldstrom, at the start of the flight recounted here.

The Uncovered Wagon

By John Goldstrom

WITH the passing of the pioneer decade of the Air Mail, the single-motored plane with open cockpits has given way to the tri-motored flying limousine, billowing with upholstered comfort. That is progress. The veteran pilot who thawed out his frapped mustache with the warmth of the language he vented on the old crate appreciates the comparatively sheltered life he now leads—but sentimentally he misses the uncovered wagon of the pioneering days on the Transcontinental.

When, as special agent of the Air Mail Service, I flew with the first through delivery of air mail between New York and San Francisco after the organization of the Transcontinental Route in 1920, I experienced the absolute height of discomfort in travel. Later, flying over the European airways in cabin planes furnished with comfortable arm chairs, I found myself envying the pilot in his partly open cockpit out in front. It is undeniable that something of the thrill of old-fashioned cross-country flying is lost behind the windowed walls of a cabin.

The first air mail line, between Washington and New York, began operations in an experimental way on May 15, 1918. The first flying mail cars were discarded military training planes, affectionately known as Jennies. They are described in the archives of the Air Mail Service as having been "wholly unsuited even to primitive air transportation. Carrying 200 pounds of mail these planes traveled at about 90 miles an hour (maximum speed).

The First Enterprise

"The line was operated by Army flyers until August 10, 1918, when the Department came to the conclusion that a civil service could best be operated by civilian personnel. Accordingly, on that date the world's first legitimate non-military air transport enterprise came into being."

It seems to an air traveler who has flown a good many thousand miles with Army flyers in Jennies that Post Office departmental language is, perhaps unintentionally, a bit snarky there. The military aviator and the Jenny have literally been highly important factors in the development of American aviation, including the Air Mail. Not a few of both are still so engaged. Most of the air mail pilots, past and present, have been military aviators—including one Lindbergh.

"The Department soon learned," says the history, "that the Air Mail could not well compete with the fast trains over short distances. It became apparent that, when an hour was consumed in getting to and from each terminal field, little was saved by airplane over the five-and-a-half hours' schedule maintained by railways between Washington and New York. It became evident therefore that the great speed of the airplane could best be utilized over long

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distances and between large centers of population. This was the genesis of the idea of the transcontinental air mail—an idea similar to those which had fascinated early pioneers, ideas which ultimately resulted in our coast-to-coast railway system.

Enter the "D-H"

"On May 15, 1919, just one year after the first plane had taken off from Washington, the first flight was made on the Chicago-Cleveland route, a distance of 327 miles. Equipment, in the meantime, had been somewhat improved, and a larger type of plane, capable of carrying 300 pounds of mail and equipped with the 400-horsepower Liberty engine, was obtained. But this too was unsatisfactory, and as the War Department had on hand a considerable quantity of De Haviland bombing and observation planes constructed for war purposes, some of these were released to the Post Office Department. With alterations the De Haviland could carry 500 pounds of mail, and its Liberty motor developed a top speed of 120 miles an hour."

The New York-Cleveland route over the Pennsylvania Alleghenies, connecting the Atlantic seaboard with the Great Lakes region, was established on July 1, 1919. The airway is 399 miles long. Then came the extension from Chicago to Omaha, 425 miles, operations over which were begun on January 10, 1920, although daily service was not in effect until the following May.

"Pilots ambitious to press on over new territory, and cities eager to receive them," the annal records, "led quickly to an extension of the air line west of the Missouri River. The engineers who, years before, had sought the lower levels for the Union Pacific Railway, had shown the easiest way for the airman.

"Thus, the remainder of the 2,665-mile ocean-to-ocean route to San Francisco naturally followed the route of the Overland Trail: via North Platte, Cheyenne, Rawlins, Rock Springs, Salt Lake City, Elko and Reno. On September 8 of that year (1920) the first flights were made connecting up the various lines between New York and San Francisco.

Home-Made Maps

"Judged in the light of what has been achieved since, this was a remarkable demonstration. Pilots in those days made their own maps, and got their fields wherever they could find them. Flying only by day the mail planes attracted attention to aviation at a time when practical interest, as differentiated from abstract discussion, was at a very low ebb."

It was before the days of emergency landing fields, beacons and a highly organized system of radio weather reports. Before 1920 a number of aviators on special flights had carried letters from coast to coast, but there was no through schedule of transcontinental air mail in effect when my flight was undertaken. Mail westbound from New York usually was "jumped" by plane to Chicago and there entrained for points farther west.

Accidents and fatalities were to be expected in so difficult and dangerous an undertaking as pioneering a transcontinental air mail service across 2,665 miles of mountain, desert and plain, through fog, rain, snow, and wind storms, with makeshift planes. But in the latter months of 1920 so many planes were burned and crashed, with accompanying loss of life, that it became evident that something more than the flying hazard was involved. Pilots on some of the divisions went on strike against the authority of division superintendents who were sending them into the air with defective equipment. The mail planes became known as "flaming coffins."

There is a world of difference in flying the mails in these days compared with Mr. Goldstrom's experiences in 1920. Then there were no beacons, no emergency landing fields, and no flying by night. Just as a contrast with present day conditions it will be interesting.

I had written an editorial about it, but that didn't seem to do any good. Another plane crashed within a few hundred yards of where it was written. I arranged with the Scripps-Howard papers for backing and a series of syndicated articles, and went to Washington, where I obtained the very reluctant permission of the then Postmaster General Albert S. Burleson to fly across the continent with a sack of mail. To make it legal I was appointed a special agent of the Air Mail Service, without compensation, to make a public report on the condition of the service. I was to fly over one division a day with a special consignment of mail, and there was to be no attempt for a speed record so far as elapsed time between New York and San Francisco was concerned. Which was just as well, as things turned out.

I was given a reconstructed De Haviland bomber, powered with a 400-horsepower Liberty engine. It had two cockpits, the front one for the mail and the one in the rear for the pilot. At Hazelhurst, Long Island, then the eastern terminal of the Air Mail, I shoehorned myself into the front cockpit with the mail, early on the morning of December 28, 1920. My pilot as far as Cleveland was to be Wesley L. Smith, recently out of a hospital, his face scarred from the effects of a burning crash. His skill in sideslipping with a flaming plane had barely saved his life.

The morning was intensely cold and snow was in the air, with prospects of more snow and colder over the Allegheny Mountains. The regular New York-Cleveland plane, piloted by Wilfred B. Warde, took off shortly before eight o'clock. Over Brooklyn his motor began to miss and he returned to Hazelhurst. Whereupon we proceeded to become useful. Warde's mail was transferred to our ship, some of it jammed into my already crowded cockpit and the rest strapped to the lower wing. We took off at 8:10 o'clock.

Hedge-Hopping

The air was frosty and bit sharply through my flying clothes as we headed west against a 25-mile wind and crossed over New York. Then over the icy Hudson and through snow over the Jersey Palisades. Over the Alleghenies in Pennsylvania the ship plunged and pitched violently against gusty winds. We ran into fog and more snow. The mail pit had not been constructed for passenger comfort, and as I was sitting a bit too high, on mail sacks and behind a makeshift windshield, I caught the icy gale of the propeller wash. I became severely airsick, thought of excellent excuses for abandoning the flight at the first stop, and then became utterly indifferent to the evident possibility that the stop might be made in a tree in the upper Alleghenies. For a low ceiling was forcing Smith to skim the wooded mountains so closely that it was found afterward that our landing gear had snatched a branch from one of the trees —lurching through the clouds at nearly a mile and a half a minute.

A "Stiff" Upper Lip

At Bellefonte, Pa., the half-way stop for fuel, tender hands pried me loose from the mail pit. I was almost literally frozen stiff. We had been in the air a little less than three hours. Field Manager M. J. Kelly advised me to call the flight off for the day, but I managed to climb back into the cockpit for the remainder of the run to Cleveland. Cramps and chills enlivened this part of the flight. It was about ten below zero at three thousand feet. We landed at Martin Field, just east of Cleveland, about three o'clock, having flown from New York in a bit less than five and a half hours of flying time.

At the Cleveland station the kindly John Whitbeck, division superintendent there, slapped and massaged warmth into my frozen flesh. Pilot Smith's black mustache had been frappéd to Arctic whiteness by frost. He was appropriately complimented by another pilot on having kept a stiff upper lip through

one of the roughest air mail runs since the division was organized.

With W. D. Williams as pilot I took off in the wake of the regular mail ship for Chicago at 10:30 o'clock the next morning. Cruising against a strong wind over the snow-edged shore line of Lake Erie, we flew low most of the way to Bryan, Ohio, the fuel stop. There a hospitable mechanic offered us sandwiches and something decidedly warming to drink. For good reasons of my own I had to decline the sandwiches.

Warming-Up

We left for Chicago against a stiff but eventually moderating head-wind and crossed Indiana at good speed, flying over the farmlands at an average altitude of less than one thousand feet. Crossing over Chicago a mile above the city for safety, we were warmed by the heat rising from it. The run from Bryan had been the most comfortable hop so far. I was getting my air legs. Landing at Maywood Field, we had come from Cleveland in less than four hours. Flying against the prevailing head-winds which move from west to east, our time for the 742 airway miles from New York was nine hours and six minutes.

Pilot Walter J. Smith took me off for Omaha, via Iowa City, at noon against a 25-mile wind. A few miles out of Chicago, to warm himself up a bit Smith dove down on a westbound express train, and after spiraling around the locomotive smokestack a bit he breezed away from it like a pay-car passing a tramp. We passed through snow flurries near Clinton, where we crossed the Mississippi River, but the air was becoming warmer and clearer, and flying was pleasant. Thanks to a few readjustments of the cockpit and the windshield, I was better protected against the cold air. I had learned, too, to be careful to the last degree in seeing to it that my flying clothes were tightly fastened at the neck, the wrists and the ankles, to keep out the searching zephyrs which otherwise chilled to the marrow.

Nearly Half Way

At Iowa City Pilot Harry H. Rowe took the stick. Near Kellogg, Iowa, we were making excellent time against a moderating wind, and I was dozing restfully, when Rowe sighted a mail plane in a wheat field. We alighted in the snow and learned that Pilot J. T. Christensen had been compelled by a defective oil feed and an overheated engine to make a forced landing. We took aboard as much of his mail as we could carry and proceeded toward Omaha.

The three last-named pilots—Smith, Rowe, and Christensen—were killed in various accidents not long afterward.

Soon we passed over the shining dome of the Iowa State Capitol at Des Moines, and shortly afterward crossed the Missouri River. It was now sunset, and we had barely enough daylight left for the landing at Omaha. Excluding the time taken for the fuel stop at Iowa City and the emergency landing near Kellogg, we had made the 424 miles from Chicago in a little over four hours, or at an average speed of about one hundred miles an hour. I had traveled the 1,166 miles from New York in 13 hours and 11 minutes of flying time.

I had come nearly half way across the continent without experiencing a forced landing—mostly, except for the Alleghenies, across fairly level country, on which a forced landing would not have been especially difficult—as was demonstrated when we picked up Christensen's mail. When I bragged a little about my good luck thus far, W. I. Votaw, superintendent at Omaha, remarked, "You have ahead of you the windy plains of Nebraska, the buttes of Wyoming, the Rockies and the Sierras, and you are going to be real lucky if you don't run into a little grief before you get to Frisco."

Five Forced Landings

Votaw proved to have been not unduly pessimistic. The weather became rougher, and I was to learn in the next few days that flying over western geography in midwinter can produce many kinds of grief. Mine included five forced landings: one for engine trouble, one for a leaking radiator, another in a hurricane, another in a blizzard, and still another in a howling dust storm in the desert between Elko and Reno, following which my pilot and I were temporarily listed as casualties of the air mail.

With Tex Marshall as pilot I left Omaha the next morning at 11:35. We took off against a 40-mile wind, which increased in strength and became a gale, with a velocity of more than a mile a minute. In this we were tossed about, two thousand feet above the plains of Nebraska, in a manner which, by comparison, would have made a trawler in a North Sea hurricane seem as steady as a lighthouse.

We took half an hour to pass over an express train which in ordinary weather we would have passed as if it had been side-tracked. A DH4 with a 400-horsepower motor can make about two miles a minute through still air. Ploughing through or bounding over the heaving waves of an invisible but none the less tangible ocean of air, I yearned to get out and walk, or at least lie down. Neither being practicable, I gave myself up to the feeble hope that we would find a haystack at the bottom of one of the waves and stay there.

I had forgotten to put cotton in my ears, and my head ached with the deafening roar of motor and propeller a few feet in front of my cockpit. The cold blast of the propeller wash tried to pull my head off, and its success seemed imminent. And so, when Marshall with great skill docked us in a vast grain field near Lexington, my first forced landing of the flight from New York did not disappoint me in the least. I didn't know the reason for it and didn't particularly care. I was glad to climb out and stagger around a bit.

Buffalo Bill's Bucking Bronchos

No one was in sight when we landed, but in less than five minutes a score of farmers had flivvered to the stranded mail plane from all points of the compass. From their various farms they had seen us circle for a landing, and were surprised to find that we had not crashed. The radiator had cracked under the strain of the buffeting winds. Farmers quickly helped us get enough water to refill the leaking radiator, on which Marshall made emergency repairs. One of them had been an airplane mechanic in the war; he helped us spin the prop, and we were off again.

Lurching crazily upward into the gale, we were thrown almost on our backs. It required Marshall's fanciest piloting to get us up to a safe altitude and on an approximately even keel. Soon we were over the Buffalo Bill country. Flying over the famous Cody ranch, it seemed as though the ghosts of a thousand wildly bucking bronchos were pawing the air around us. I have never ridden a bucking broncho, and have no ambition in that line; but it can't be much more diverting than riding a bouncing mail plane. You can't fall more than a few feet from the back of a horse, in the ordinary course of events; but in a cavorting airplane, when you are tossed downward a couple of hundred feet, only the safety belt prevents you from being thrown for a complete loss. You land with a jar in the trough between two atmospheric waves, grateful that a careful pilot has kept another few hundred feet of altitude between the bottom of the trough and the ground.

"While there's altitude there's hope," is one of the most familiar sayings among airmen.

Seventeen Hours' Flying

We had hoped to make Cheyenne that night, but when we reached North Platte we had used up all the available daylight and decided to call it a day. We both were air-weary, and glad enough to spend New Year's Eve in Buffalo Bill's old neighborhood. Deducting the time taken for the forced landing, it had taken us three and a half hours to travel the 248 miles from Omaha. The fourteen hundred miles from New York, bringing us more than half way across the continent, had been flown in less than seventeen hours of actual flying time.

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I found I had lost fifteen pounds in weight since leaving New York (I was to lose another seven), and was more than half deaf from the roar of the power plant; but I had found my air legs to such an extent that only the most violent pitching of the plane affected me much. The blood of Viking ancestors had reasserted itself in an almost sedentary city dweller. Eric the Red would have enjoyed the trip, but he would have needed the stoutest of sea legs to have comfortably weathered the first thousand miles.

New Year's morning we left North Platte for Cheyenne. We had been up about two hours, flying less than a hundred miles against a wind which at times hit us with a velocity of ninety miles an hour, when another leak was sprung in the radiator. The consequently overheated motor forced us to take to the plains again, in a wind that would have made Jules Verne's prairie schooner veritably fly. When we were landing a hurricane gust struck us under the right wing and nearly landed us upside down.

Several Scandinavian farmers refilled the radiator again. I made "contact" from the pilot's seat while Marshall spun the prop. We got away again. We were within sight of Cheyenne, some forty miles away, when the engine curled up. The landing was made near a ranch house. We were among the buttes of Wyoming with, as Marshall put it, a "beaut of a radiator." He said other things about it.

Blizzards!

More emergency repairs, and we were in the air, and half an hour later at the Cheyenne station. It had taken us three and a half hours to fly the 210 miles from North Platte: fast enough for a train, but slow even for a pioneer air mail plane.

Acting Superintendent H. L. Hartung told us that every plane on the division had been forced down, one of them upside down.

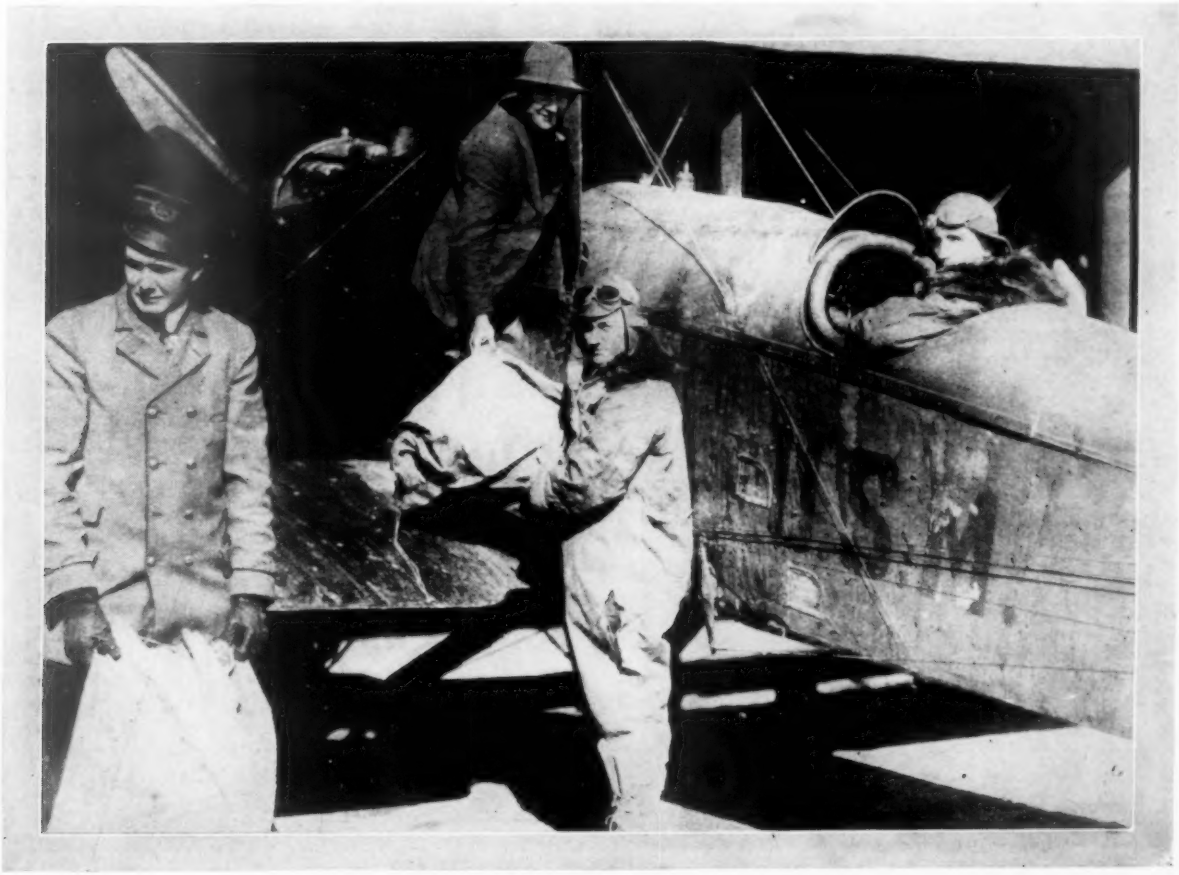
Monday morning, with Harry G. Smith as pilot, I headed for Salt Lake City via Rock Springs, Wyoming, and the first range of the Rockies. Harry was the fourth Smith I had encountered on the Transcontinental. Paul W. saw me off at New York, where he was superintendent at the eastern terminal station; he had flown the first mail between Chicago and New York. I have mentioned the other two as my pilots, respectively, from New York to Cleveland, and from Chicago to Iowa City. None of the four was related to any of the others.

With the heavier clouds clearing the mountains at a good altitude, the radio reported a high ceiling. We rolled off the field against the usual stiff wind. Soon we were over Sherman Hill, against which Pilot Woodward had recently crashed in a fog and been killed. We were emerging from a mountain pass in the first range of the Rockies at an altitude of a little less than ten thousand feet when the sky began to lower. Snow clouds. We began to plunge and twist. As we passed north of Medicine Bow the snow whipped about us in a blinding blizzard.

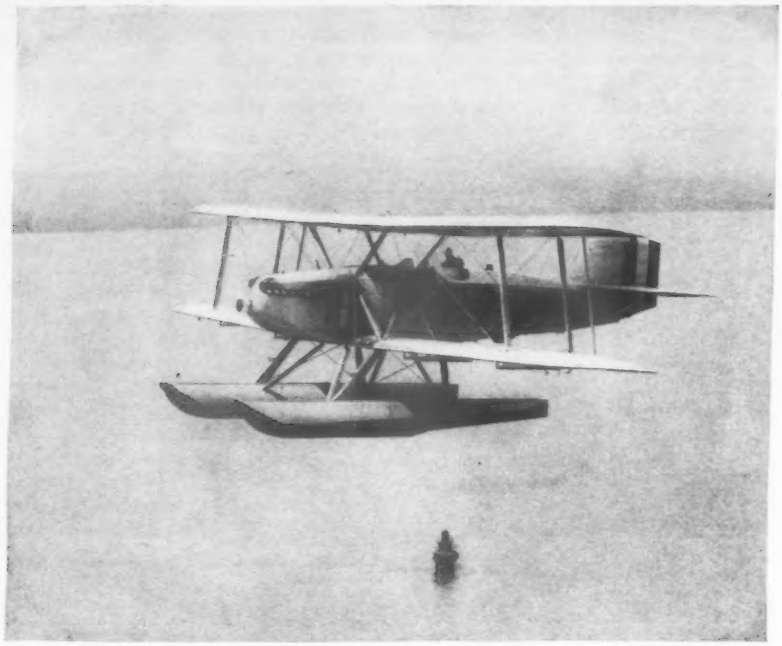
I found myself taking comfort in the reflection that Harry Smith was rated as one of the most skilful pilots in the service. Against a seventy-mile wind blowing against us over Elk Mountain we made hardly thirty miles an hour. Snow obscured the windshields and lashed our faces. Goggles became almost useless.

We had crossed the range and were over a stretch of sagebrush when Smith

(*Continued on page* 86)



The finish of the flight and the final delivery of the sack of mail.



Smooth air, a clear day, and a Navy S-C-1.

Over the Seas with the Navy

By Andrew R. Boone

WHILE aeronautical engineers and flying personnel have been capturing the world's attention with the astounding modern advance in flying equipment and in piloting that equipment through the air, the Navy of the United States has engaged itself in a long series of problems peculiar to flying over oceans. Though scarcely heralded and but little understood outside the military services and a few pilots who intend to be interested in inter-continental traffic, the Navy's work is now seen as of the utmost importance and places the Naval air service in the forefront of the next great development in practical aeronautics—regular and safe overseas air traffic.

Different Flying Problems

The Naval Bureau of Aeronautics makes a simple statement. It says, "Naval aviation has increased in safety by five hundred per cent in eight years."

But it does not explain that behind that statement a field of development has sprung up which is as peculiar as the sea itself and which has been solving problems of flying over water seldom, if ever, met with by pilots accustomed to flying over land.

Four years ago, the Naval authorities strenuously opposed the organization of a single air force which would take Naval aviation out of the hands of practical Naval officers, and today, just as strenuously opposed to such a plan, the Navy is able to offer practical proof of the necessity for retaining its control of sea-going aviation. It demands that its pilots know the sea even better than they do the air—and it requires years of experience to treat with the vagaries of Neptune.

Ship Weather Stations

Primarily to aid the Navy in conducting vast overseas operations of both long and short distances, thirty-two branches of the United States Weather Bureau have been established in ships of the Navy, and a scheme of accurate meteorological information so organized that every Naval scout on the far fringes of the Fleet as it moves seaward is a weather bureau unit constantly relaying weather information back to the main fighting forces, whose air squadrons are guided by the directions given.

Out on the Naval scouting lines, test planes are sent up every hour as the Fleet moves along, and their information immediately radioed back to the Fleet Flagship for the benefit of the main fighting center of air forces, so that when the enemy is met, they may go aloft fully informed as to what they may expect and be guided thereby.

While this activity is in progress within the Fleet, the Commanding Admiral orders all pertinent dispatches of a meteorological nature to be sent to the nearest United States weather bureau station on land, for dissemination to all weather bureaus.

This work within the Fleet is but the first step in a general plan to provide regular overseas weather information whether the Fleet is at sea or not. Experience thus far gained by the Fleet has led Naval officers to propose the establishment of such a regular service, organized if necessary under international control, to facilitate regular and safe mercantile traffic overseas by air.

Aiding Coastal Forecasts

It has also been proposed by Naval officers that such a service would save hundreds of times its costs by aiding agriculture alone, and would eliminate much unprecise guess-work by coastal weather bureaus. Recently, weather information given an important projected trans-Pacific flight was shown to be accurate only for a distance of 400 miles from the American coast and to an altitude of but a thousand feet. Two thousand feet high, three thousand feet high and four thousand feet high, radical variations were encountered and after passing the 400 mile limit the sun of California was obscured by a cold fog over the Japan current, which could, of course, not be successfully prognosticated by the weather bureau at San Francisco.

In April, 1928, the Fleet departed for Hawaii. Every hour it sent four test balloons aloft and one airplane took the air for personal observation. Until the

Fleet entered a period of radio silence before the battle off Hawaii, there were a few days during which perfect weather information was available at San Francisco, and two important climatic changes were successfully announced as approaching the coast. As a matter of fact they affected the entire area west of the Rocky Mountains.

It can be easily seen thereby just what value a regular service would have on land, as well as becoming a positive necessity for any regular traffic by air between Hawaii and the mainland United States.

Special Carrier Stations

While thirty-two official weather bureaus are maintained in the Fleet, the two great carriers, Lexington and Saratoga, are each served by a staff of eight aerographers and aerologists, educated by the Navy and commanded by specializing officers for that duty.

These two vessels are registered weather bureaus and give and exchange information wherever they may be, with the United States Weather Bureau system. Every day, whether in port or at sea, their work proceeds in accordance with the Weather Bureau system.

Within the all-expansive arms of this vast weather-protective organization, the Fleets operate their aircraft.

The operation of air forces over the water places heavy responsibility upon both Commanding Officers and their flying officers. A nicety of judgment is required to alight a heavier-than-aircraft in seas which are moderately heavy, and pilots must be expert in judging whether or not alightments can be safely made in various types of seas and currents. Furthermore, it is required that they be capable of sailing their planes, if they be flying boats of the PN category, if they are disabled on the surface of the sea. Commander John Rodgers in 1925 afforded a classic example of what is meant here, when he was forced to alight 400 miles from Honolulu on his trans-Pacific flight, and sailed his plane within sight of the island of Maui to be rescued by a scouting submarine. He was loath to accept a tow-line for he could have made the beach in another two hours' sailing. He was "lost" nine days. It is probable he would never have been found had he not been able to man his craft as a seagoing ship. This was the result of the Navy's peculiar training.

The seagoing pilot must be accustomed to landing his plane on the deck of an aircraft carrier. This may sound simple, but it becomes a desperate undertaking when the deck upon which one wishes to alight is describing a rapid arc in the water and rising and falling from four to twenty feet with the motion of the restless sea. In the spring maneuvres of 1928 off Hawaii, a Naval pilot lost his life flying toward such a deck, but such an occurrence is not frequent, though dives off the deck into the sea do occur several times a year, with quick rescues of the personnel following.

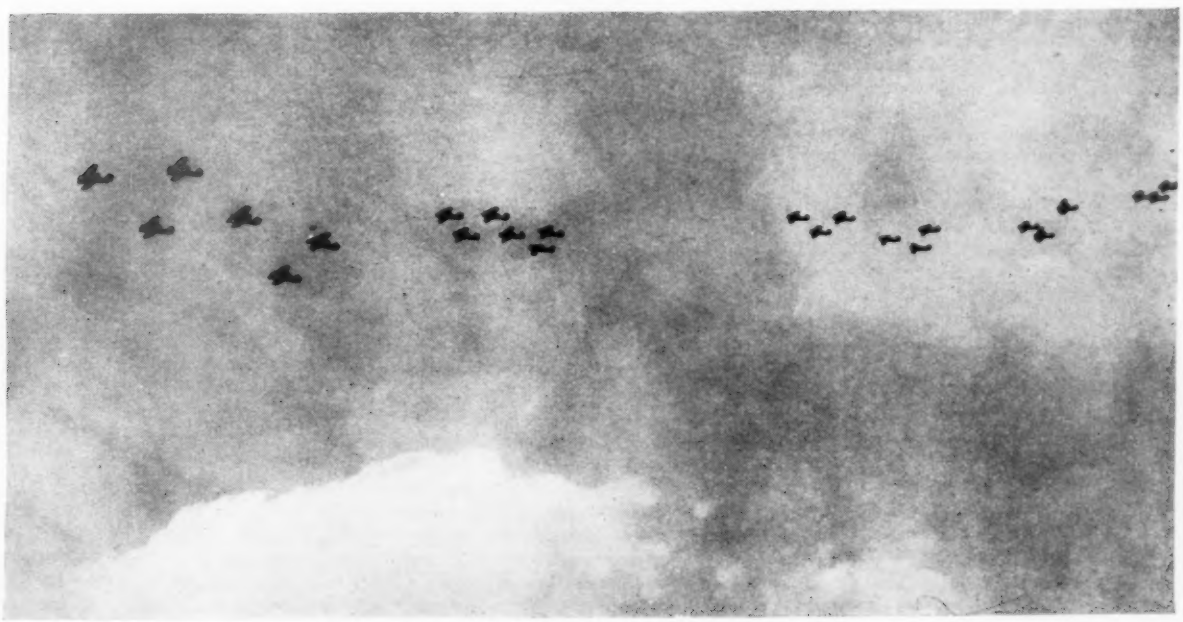
Rescue apparatus is at hand day and night on these decks, and men clothed entirely in asbestos uniforms are ready to save life in the event of fires following crashes to the decks. As the weather prognosticating system protects planes in the air from the elements, so do the local ship rescue systems care for pilots on and near the flying decks.

Once trained in landing on these decks, however, pilots become marvelously expert at the work, and day in and day out they train at landing and taking off, to become expert in the process. It is a delicate balance of judgment which must be called upon if the pilot is to know just when to cut out his engine upon approaching the flying deck. If the engine is cut out too soon, the descending plane is apt to crash into the carrier below the deck. If the engine is cut out too late, the arresting gear on deck which grasps and holds the plane, may be carried away, or the plane's own landing gear may be torn off, or the aircraft may tip over on its nose with disaster for all concerned.

All Units Carry Planes

Besides the carriers, all major units of the Fleet carry airplanes, and planes are now being fitted to destroyers, submarines and vessels of the train. It is planned to mount aircraft, too, upon merchant vessels in time of emergency.

Such aircraft are cast off by catapults, and they have no decks upon which to alight when returning from their missions. Instead, they must alight in the water near their mother ships and be picked up with davits and winches, or by booms. It is a distinction of the pilots of these craft that they have not yet, in five years of operations, lost a single plane by bringing it down in impossible seas. Flown by trained Naval officers, the planes are brought down skilfully so as to take advantage of the motion of the seas, rather than to permit the seas to smash the aircraft. It is needless to



Navy planes in formation high above the clouds.

indicate that skilled seamen only are capable of such work.

In addition to the aircraft carrier vessels, the following Naval ships now carry airplanes and catapults for launching them: USS Pennsylvania, Colorado, New Mexico, Idaho, Arizona, Mississippi, California, West Virginia, Maryland, Tennessee, New York, Omaha, Medusa, Texas, Wright, Sandpiper, Teal, Gannet, Florida, Wyoming, Arkansas, Utah, Memphis, Trenton, Detroit, Concord, Milwaukee, Raleigh, Jason, Richmond, Marblehead, Cincinnati, Avocet and Heron, some thirty-four ships in all.

The Navy's aircraft forces at sea are divided between the Aircraft Squadrons, Battle Fleet, and the Aircraft Squadrons, Scouting Fleet. Also considered on sea duty are two squadrons at Hawaii and the Philippine Islands.

Serving these squadrons from the shore are seven Naval Air Stations, located at Anacostia, D. C.; Hampton Roads, Va.; Lakehurst, N. J.; San Diego, Calif.; Coco Solo, in the Canal Zone, and Pearl Harbor, Hawaii.

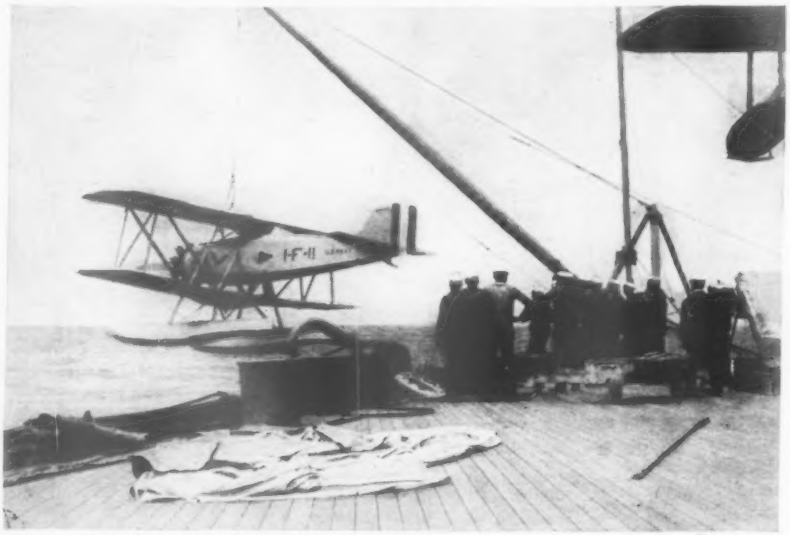
Aircraft Squadrons are also attached to the East and West Coast Expeditionary Forces of the Marine Corps, based respectively at Quantico, Va., and San Diego, Calif. A Marine Observation Squadron is based at Port au Prince, Haiti, and a Patrol Squadron of Marines at Sumay, Guam, in the Marianas Islands.

The pilots of these squadrons are required to be able to distinguish enemy aircraft and seacraft at great distances. They are instructed in picking up an enemy ship by its silhouette, deciding upon its class and type and reporting back its apparent course and intentions to the Fleet commander. Much of this knowledge is derived from the long and intensive training given all Naval officers in this subject.

Their duties may run all the gamut from attacking enemy ships with machine guns, smoke and gas screens, and bombs, as well as torpedoes, to scouting for spent torpedoes. Regular practice is given in locating torpedoes spent in the annual target torpedo runs. No service in the land air forces resembles this work; it is peculiar to the Naval air forces.

Methods are now in development by which Naval aircraft will be enabled to photograph an antagonist's forces, develop the pictures in the aircraft and transmit a finished picture by radio to the surface Fleet within a few minutes.

The ground work for this was laid during the installation of improved aerological laboratories on the aircraft carriers Saratoga and Lexington, when the transmission of complete weather maps by radio "television" apparatus was tried. It is now possible to transmit complete weather maps from shore to ship and from ship to shore by this method. It is only necessary to fit it to actual flying forces aloft.



Hoisting in a seaplane on the U. S. S. West Virginia.

In fact, almost completely new aerological apparatus is now being furnished the Navy, including the new theodolite, with which test balloons are followed from surface observation stations as they ascend into the upper air strata.

For the Fleet at sea, a vast experimental program is now coming to a conclusion. It has been the basis of a decision to utilize the following types of ships for sea use:

Fighting planes: small, easily handled planes of high performance, based upon battleships and aircraft carriers, used primarily for offensive by attacking enemy aircraft and for protection of bombing and torpedo planes.

Observation planes: somewhat larger planes, capable of keeping the air for several hours at a time. Employed for spotting gunfire from battleships and as scouting planes from light cruisers.

Torpedo, bombing and scouting planes: convertible or amphibian airplanes, capable of carrying large military loads, consisting of torpedoes or bombs. When not so loaded, equivalent weight of gas for long-distance scouting may be substituted.

Patrol planes: large, seaworthy, long-distance scouting planes, based ashore and used for coast defense, patrol, reconnaissance and for transport work.

Club Notes

The flying club of Hornell, N. Y., incorporated as Hornell Airways, has purchased the most desirable location for a landing field in the vicinity of Hornell and it is expected that the port will be made available to flyers very shortly. Hornell is on the direct line from Buffalo to New York, and the proposed airport will be three miles north of the city of Hornell.

Aviation is claiming more and more of the attention of students in schools and colleges, and in many institutions where no actual aeronautical training is offered, extra-curricular activity in this field is encouraged. Among the colleges where flying clubs have been organized recently is Duke University, of Durham, North Carolina. T. A. Aldridge is at the head of the new organization.

The Tome Aviation Club of the Tome School, Port Deposit, Maryland, recently enjoyed a lecture by Mr. Richard M. Mock, Associate Engineer of the Bellanca Aircraft Corporation of New Castle, Delaware. Mr. Mock lectured on "The Bellanca Airplane and Airplane Factory Operations." J. Exton Presley, secretary of the club, writes that the lecture was of great interest and that the club plans to invite other guests to address the club meetings from time to time on aviation topics.

A flying club has been formed in New Britain, Connecticut, with a membership of fifteen. The club will be known as The Hardware City Aero Club. Plans are complete for securing a plane by early summer, and it is the ambition of the club to qualify all members as pilots.

The Toronto Flying Club reports a busy winter. In spite of the snow, flying has been going on regularly. Skis on the club planes have proved most successful.

XUM

Sound Proof Airplanes

By S. R. Winters

Mr. V. L. Chrisler of the Bureau of Standards and the sound-proof airplane cabin he has designed.

BY means of an exterior covering of duralumin and an interior lining of "Insulite"—a cross between glass and metal—a virtually sound-proof airplane cabin has been developed by the Sound Section of the Bureau of Standards. The special insulating material consisted of a fiber known as "Dry Zero," which not only absorbs sound but imparts warmth to the cabin—a factor favoring its use on high-altitude flights when below-zero temperatures are encountered. The so-called noiseless airplane cabin was constructed without sacrificing the weight minimum ordinarily required in aircraft design.

The Aeronautics Branch of the United States Department of Commerce sponsored the sound-proofing tests of airplane cabins, and W. F. Snyder was detailed as a special assistant to V. L. Chrisler of the Sound Laboratory, in conducting this pioneering experiment. While the Bureau of Standards, as a result of these tests, admits that exhaust mufflers having greater efficiency may curtail airplane noise at its source and that future designs of propellers may be less noisy, the sound-insulated cabin is the most vulnerable point of attack in mastering the construction of noiseless airplanes. The problem of sound-proofing is not a simple one, we are told, since an airplane produces sounds of both high and low frequency.

The "deafening roar of an airplane," a figure of speech, is hardly adequate in describing the intensity of sounds issuing from flying craft. The physical scale employed by the Bureau of Standards' acoustic engineers defines the number of units to which the human ear is sensitive as 108, and of this wide range the noise of an airplane embraces 100 units. The proverbially noisy subway of New York city radiates only 80 noise units and the noise on a busy street of Chicago or New York registers only 60 sensation units. The rustle of leaves in a gentle breeze produces only 10 sensation units and soft music issuing from a radio loud-speaker is productive of 40 sensation units.

Curiously enough, the same instrument employed in measuring the sound intensities of an airplane was used in recording the roar of Niagara Falls.

Despite the large number of noise units produced by an airplane—from 80 to 100 sensation units—the sound-proofing tests of the Bureau of Standards lopped off 38 of these noise units. This is a surprisingly large reduction when we are reminded that the insulating treatment was applied to an actual cabin of a Ford plane, loaned by the Navy Department for the purpose. This curtailment of noise is best expressed in results of comparative tests on a plane in flight. The portion of the flying machine subjected to blankets of fibrous material, fiber board, and special insulation permitted of conversation in the cabin without raising the ordinary tone of the voice. However, in the section of the cabin not modified by the sound-proofing experimenters the voice had to be raised and sentences repeated in order to establish understandable conversation.

The revamped Ford airplane cabin—or, at least, the half subjected to the sound-proofing process—involved both exterior and interior modifications. For instance, the interior finish of the forward part of the cabin was displaced and in its stead was introduced a 2-inch layer of "Dry Zero" blanket, a fibrous material that absorbs sound. This blanket was positioned adjacent to the outer metal covering. Over this fibrous material was secured a layer of fiber board, one-fourth of an inch thick. This fiber board was enveloped with another 2-inch layer of

"Dry Zero" blanket, and the inside was finished with perforated sheet-aluminum. The windows of the cabin, in their original state, were of very thin glass and since this would have probably thwarted the objective of the sound-proofing tests they were also treated. Their treatment prescribed a glass structure one-fourth of an inch thick. The noise measurements were made by three observers while the airplane was in flight, and the modified cabin approached that of a noiseless one by at least 38 sensation units, which were lopped off. If, point out the observers, the floor of the cabin had been treated with sound-proofing material there would have been a still further reduction of noise.

Three Cabins Built

Preliminary to the tests on an airplane in flight, the Sound Laboratory of the Bureau of Standards built a series of three airplane cabins for test purposes in the sound chamber. The first of these cabins was covered with airplane fabric and varnished, a practice common to conventional manufacturing processes. The second cabin was enveloped, outside and inside, with 3-ply ply-wood, admitting of an air space of 1¾ inches between the two layers. The third cabin, which is illustrated by one of the photographs reproduced with this article, was given an exterior covering of 0.02-inch duralumin and an inside covering with one-fourth-inch "Insulite." The latter product is not as stiff as glass, differs from metal, and yet it possesses a sound-absorptive quality not found in either glass or metal. The space between the outer covering of duralumin and interior lining of "Insulite" on Cabin No. 3 was stuffed with a fibrous material, known as "Dry Zero" blanket. This is a natural fiber and, oddly enough, nature closes the end of each tube of this fiber.

Absorption Necessary

This experimentally sound-proof airplane cabin was supplied with an extra layer of 2-inch "Dry Zero" blanket, positioned over the glass-like "Insulite." The inside of this cabin was completed with a protective coating of perforated sheet aluminum. The latter served the primary function of absorbing sounds which might seep into the cabin. "It can be shown theoretically," points out the Sound Laboratory of the Bureau of Standards, "that if there is no absorption in a closed space the intensity in this space, after a steady state is reached, is the same as the intensity outside the inclosure, no matter how good a sound insulator the walls may be.

"For this reason," continues the Bureau of Standards, "it is advisable to line the interior of the cabin with some very absorbent material to prevent the sound that does pass through from building up to a disagreeable intensity. Any material which has a relatively high absorption at the lower frequencies will serve this purpose. Unfortunately, few materials are good absorbers at low frequencies. Taking weight into consideration, "Dry Zero" blanket was the best absorber that was found. It was, therefore, used in all of these tests." Incidentally, the sound-proof cabin weighed 1.24 pounds to the square foot (exclusive of the wooden frame) compared with 1.1 and 1.04 pounds to the square foot, respectively, of the other two airplane cabins not treated with insulating material. Yet, the sound-proof cabin represented a reduction of noise units by 30 compared with a curtailment of 4 and 18 units, respectively, of the two untreated cabins. Thus, concludes the Bureau of Standards, airplane noises may be reduced in a cabin to the point of facilitating easy conversation during flight and yet the insulating material does not contribute to the appreciable weight of the flying machine—certainly, not to an objectionable degree. Furthermore, such a sound-proof cabin is capable of retaining heat, and pilot and passengers are comfortable even at high altitudes where 60 to 80 degrees below zero are encountered.

The Radio Used

In measuring and recording the sound intensities on the sound-proofed cabin of an airplane in flight, a compact instrument known as an audiometer was employed. The Western Electric Company has used this same device for registering the roar of Niagara Falls, for recording the sound at the National Capitol, and for measuring the noise in a New York City subway. This device records noise in terms of sensation units—covering the complete ear-sensation scale. However, in the laboratory experiments with sound-proof airplane cabins the Bureau of Standards employed more elaborate equipment than the compact audiometer. The laboratory sound-intensity measurements were made with the following instruments and in accordance with the procedure about to be outlined:

A telephone receiver was stationed where the magnitude of the sound was to be recorded. The sound waves, acting on the diaphragm of the telephone receiver, develop in the windings an electromotive-force that is proportional to the amplitude of the sound wave. This force or electric energy is applied to a radio amplifier the output of which is rectified. The magnitude of the rectified current is reflected on a galvanometer, and the magnitude of this deflection may be adjusted, if necessary, by regulating the radio amplifier and shunting the current-indicating device. The galvanometer deflection is observed and the radio amplifier associated with a potentiometer, which derives alternating current of the sound frequency being employed from the oscillator or radio transmitter, previously described. The potentiometer is manipulated until the previously noted galvanometer deflection is obtained. The electromotive-force then derived from the oscillator is identical with that previously secured from the telephone receiver. This sameness, however, is contingent upon two factors—that the radio amplifier has remained constant during the two measurements and that the input-energy characteristics of the amplifier have not varied due to the substitution of a potentiometer for the telephone receiver. Such are the instruments and procedure in recording sound intensities when devising the noiseless airplanes of the future.

New Books

Of considerable interest to everyone practically engaged in the operation and maintenance of aircraft engines is the announcement that a two volume work on modern airplane power plants, by Major Victor Pagé, is shortly to be published by Norman W. Henley. Text books in this field are already available in some measure, but particular importance attaches to the publication of Major Pagé's work because of his long personal experience in aviation and his consequent qualification for the preparation of such a manual. Major Pagé was for a time Chief Aeronautical Engineer at the third A. I. C. at Issoudon, Indre, France, one of the largest aviation instruction centers in the world. Since the war Major Pagé has been actively engaged in aeronautical activity, notably in the writing of several very useful books on the design, construction and operation of modern airplanes. His Modern Aircraft, also published by the Norman W. Henley Publishing Company, is outstanding in its field.

The first volume of Modern Aviation Engines includes an historical introduction to the topic, information concerning the principles back of the design and operation of all internal combustion engines, and detailed data and instructions regarding carburetion, ignition and lubrication. Volume Two takes up specific power plants and assembles a mass of highly useful information in connection with the servicing and repair of practically all of the aviation engines available today.

This book should have wide currency because of its very practical application to the needs not only of mechanics and shop men, but also of a steadily growing number of private operators who in most cases will be obliged to maintain their own equipment.

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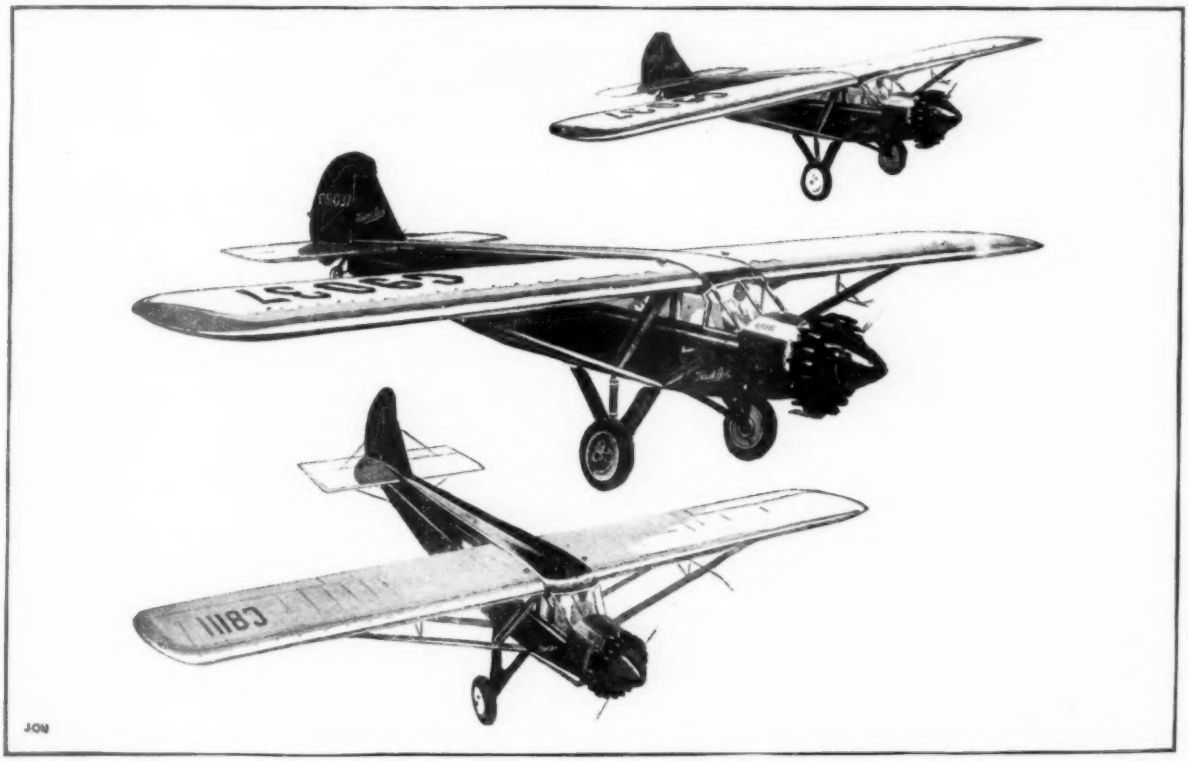

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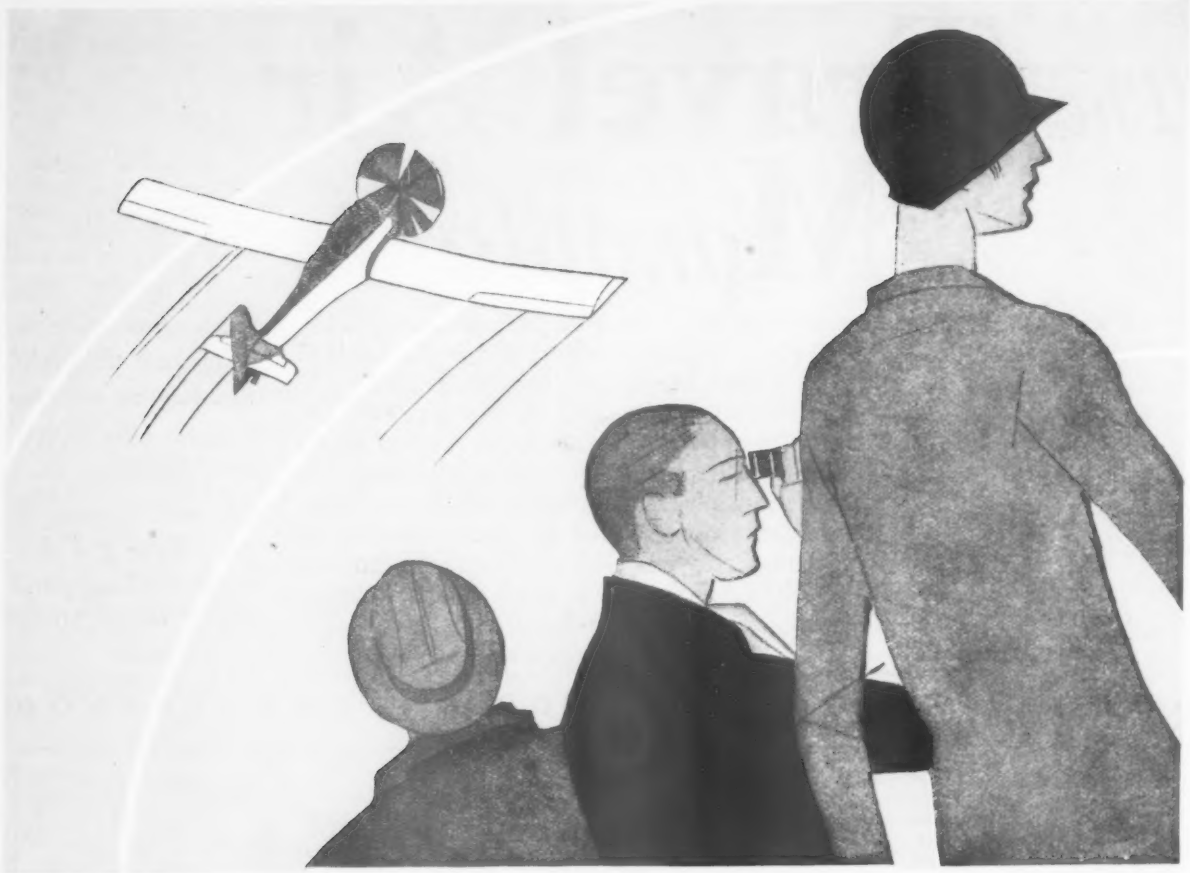

A New-Day Conception of *Safety and Performance* – by Nicholas Beazley!

Picture a low-winged monoplane, streamlined for grace and speed—eager to charge straight up a sunbeam!

Step into this plane and take off—with a very short run. In a few seconds you are in the air; —in one minute you are 1200 feet skyward, in eight minutes 8000 feet. Then forward, you sweep the sky at 105 miles an hour.

You are in the Barling NB3!

All metal structure gives unbelievable strength to this new, low-winged monoplane yet it is lighter by many pounds than other planes of equal ability. Fast as an arrow, it consumes no more fuel than a small motor car! Power it has in abundance—from a small 60 horse-power Le Blond Engine. Performance with this small power plant far exceeds that of the average ship of this capacity with twice the horse-power. Steadiness? When you fly the Barling NB3 you will believe Elliott White Spring's remark that "Anyone not blind or minus both arms can fly". Unlike the average small ship, it does not require an experienced pilot—because of its patented wing construction and the advanced method of applying the dihedral angle. Hands-off flying with perfect ease—even in rough air —is no feat at all in the NB3. And you land like a feather floating to rest.

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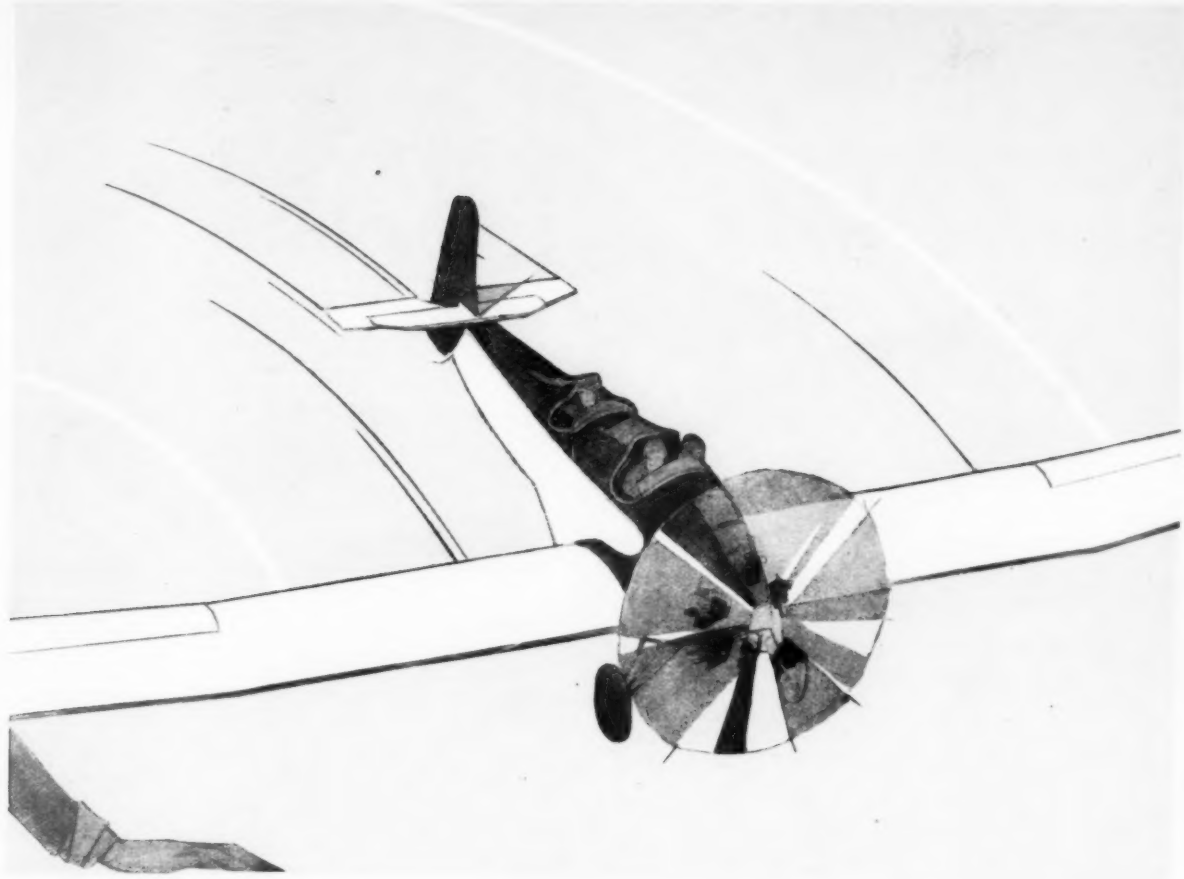

Safety has been assured by eliminating wires, turnbuckles and other lesser parts. The U-spar wing has no point of vulnerability. This construction, coupled with exceptional maneuverability, makes the NB3 eminently reliable.

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Women Who Fly

By Lady Heath

IN the history of the conquest of the air the page of women's achievement is a great one. The woman of today is something more than a wife to her husband. She is his friend, his companion, his playmate, and more often than not his business partner. The true development of the air sense of mankind depends just as much on the women as on the men. We cannot advance with a united front into the position of leadership in this new world that is ours by right, unless the women will support and help the men as they have always done in the past. Since the beginning of human flight women have stood by men not alone in actual flying, but in the development of aeronautics generally.

The women of today are happily and naturally entering into this new world of sport which has been opened to them. There is nothing new in women flying and women wishing to fly. All through the ages the hopes and wishes of man have been duplicated in his sister's heart. One of the most famous women of ancient history had leanings in that direction, for we read in the ancient Assyrian writings of Solomon giving the Queen of Sheba a vessel which he made of his wisdom, wherewith to ride upon the air, and it is extremely unlikely that he would have given that much traveled lady anything she did not want.

Marie Antoinette is said to have been the first woman patroness of aviation, and at the present time there is a famous airplane engine bearing her name.

The Montgolfier brothers' balloon "le Flesselles" was named after a Madame Flesselles, and its ascent was preceded by a special theatrical performance. In those days ballooning was a society event calling forth the presence of Royalty. At the coronation of Napoleon I in 1819, a Madame Blanchard made a special ascent in a balloon gaily decorated and trimmed with fireworks, which were probably the reason that the gas caught fire, Madame Blanchard losing her life in the descent. Madame Blanchard had held the position of director of ballooning in place of M. Jacques Garnerin, the latter having incurred the displeasure of the Emperor. Monsieur Garnerin and his wife were brilliant and daring parachute jumpers during this period.

The earliest woman aeronaut we hear of is a Mrs. Chisholm in 1784. While out walking with her husband, a balloon descended near them, and after much persuasion, and entirely against his wishes, her husband consented to his wife's making a flight, which she did successfully, and thereafter she took an active interest in aeronautics.

There is another interesting, if tragic, story in connection with early ballooning —the romantic tale of the death of Har-

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Dependability! The satisfaction of proved reliability. Confidence in those "invisibles" which are the measure of real worth. Zooming climb from take-off and short roll after contact of wheels to ground . . . characteristics that simplify emergency landings and make for *practical* commercial use.

Brilliant performance to thrill and satisfy . . . flawless workmanship to instill confidence and conquer emergencies . . . custom finish to express individuality . . .

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Standard equipment includes:

Customer's choice of colors of wings, fuselage and upholstery.

Improved type cowling and windshield for maximum protection to pilot and passengers.

Upholstered cockpits—luggage compartment.

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Metal propeller—hand starter—primer — compass — tachometer — air speed indicator—altimeter—oil pressure, oil temperature and gasoline gauges—navigation lights—fire extinguisher—emergency kit.

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ris, the aeronaut, who made an ascent with his fiancee in May, 1824. After a time Harris discovered the balloon to be leaking and realizing that they were over a place where landing was impossible and that the loss of the weight of his body would suffice to cause the balloon to rise and float to safety, he leaped to his death. The poor bereaved girl brought the balloon safely to earth.

Quimby and Law

The name of Harriet Quimby in America is well known in connection with women in aviation. On August 1st, 1911, she received the fourth woman's license issued. There was a friendly rivalry between her and Mathilde Moisant, who received her license a little later. Miss Quimby gave exhibitions at fairs. After flying for some time she decided to try to cross the English Channel, which she succeeded in doing on April 10th, 1912, in a Bleriot machine. She flew over at a height of 1,500 feet. On returning to America on May 12th, 1912, she was received with great enthusiasm, and became one of the outstanding female figures in American aviation.

Ruth Law, in private life Mrs. Charles A. Oliver, holds the third pilot license issued to a woman, which she received in 1912. She flew in China and Japan in 1918 and 1919, and earlier, in 1916, she broke the world's long distance record by flying 590 miles of her way from Chicago to New York. She made the full trip in 8 hours and 55 minutes. She also broke the world's altitude record for women in 1917, when she attained an altitude of 14,217 feet. She was the first woman to loop the loop, in 1915, and she toured the United States as the head of the Ruth Law Flying Circus.

Kate Stinson

Katherine Stinson, another American woman, maintains a flying school with her brothers at San Antonio, and is herself a daring and accomplished flyer. She is slight and her appearance is one of feminine frailty, but one has only to see her handle an aeroplane to realize her strength and skill.

One of the most outstanding names in the air world is that of Wright—the brothers Orville and Wilbur and their sister Catherine. Although she never flew, Catherine Wright devoted her life to the service of her brothers, and gave her meagre salary, earned at teaching, to further their work. Orville Wright has said: "When the world speaks of the Wrights, it must include my sister; much of our effort has been inspired by her."

Today in America there are eighteen women who hold official licenses as pilots, and at least two of these have their commercial licenses. When I took up commercial flying in 1926, I had to use all my power and influence to get the international law changed so that women could become transport pilots, and I imagine that I am the first woman to hold one. I am looking for correction if I am making a false claim. My transport license is dated the 22nd of June, 1926.

Miss Ruth Nichols who holds the American transport pilot's license for both sea planes and land planes, took her license the following year, and is doing good work with it. She is at the moment organizing Aviation Country Clubs, Inc., and has taken part in at least one epic flight and non-stop flight, from New York to Miami.

Next Month: Modern Valkyries by John Goldstrom, with the portraits and brief anecdotes of many women flyers whose exploits will long be remembered.

Mrs. Phoebe Fairgrave Omlie, who did so splendidly in the national air tour this year, also holds a transport license, but perhaps her biggest job was during the Mississippi floods, when she worked overtime to carry medical requisites, nurses, food and mail for the people who were cut off by the waters.

Another brilliant asset to the world of feminine aviation is Miss Eleanor Smith of New York, who learned to fly too young to obtain a license, and who acquired her brevet the day after she "came of age," sixteen. We look for great things from her in the future of serious aviation.

Among those who are working for this cause is the international heroine, Miss Earhart. I cannot allow her to be claimed only by America. I feel that as her marvelous feat ended in Great Britain, we want to claim a little bit of her. Not enough attention has been paid to her splendid flight across the continent from New York to Los Angeles this summer in the little Avro-Avian she bought from me, when she was entirely alone, and had to do all her own engine work and repairs.

Another interesting woman pilot and one who is well worth watching is my little friend Mlle. Marie Bastie, who flies a little Codrun Avionette.

With M. Drouhin, who was later killed at Paris in an attempted take-off for a trans-Atlantic flight, she put up a world's record for light airplanes in the distance class. They flew in a straight line without landing, from Paris to Treptow, on the 13th of July last, a distance of 657.4 miles.

Parachute jumping has for years been practiced by women, both for sport and for exhibition purposes at fairs. The longest recorded drop, 32,000 feet, was made by Miss Helen Berger of California, while another record of over 200 descents has been made by Madame Triebner of Berlin. In Paris, the "Parachute Club de France" has a large enthusiastic roll of women members, and they will arrange for anyone who is interested to make at least one descent.

A Woman Manufacturer

Madame Bolland, an intrepid young Frenchwoman, who, from 1912 to 1914, was in charge of all matters connected with French aviation in the Argentine, ran her own joyriding company in France for several years after the war. Unfortunately, however, the International Commission for Aerial Navigation has now decided that women shall not hold a pilot's "B" license which is necessary for flying for public hire, and poor Madame Bolland, after all her splendid work, is going into liquidation.

In England, Mrs. de Beauvoir Stocks and Mrs. Maurice Hewlett qualified as pilots in 1911, and during the war Mrs. Maurice Hewlett founded and ran her own Aircraft Company. They both still retain their practical interest in aviation.

Four years ago Mrs. Atkey took her certificate, and has since made some splendid flights, among which are Leeds to London in 5½ hours, and Paris to London and back in a day.

Air Sense Developing

The number of women who are now learning under the Air Ministry's scheme of Light Aeroplane Clubs, is a testimony to the development of the air sense in our women.

The woman of today drives her car as often as her brother does. She is not alone content with driving it. She knows all about it, and watches all the new developments in the motor world with the keenest interest. That is what she is going to do in the world of the air. She has ceased to dissuade her menfolk from using the highways of the air—as she used to do a few years ago—and in this way she is being an active help to those who are working for the cause of civil aviation.

Today, "Going Up" is still somewhat of a novelty. Our young mind did not take in the airplane as an essential part of the skyscape as our children of today are doing; but being an adaptable race we no longer gape and crane our necks as we used to do when the whirr of an engine is heard above us. Many wise

(*Continued on page* 86)

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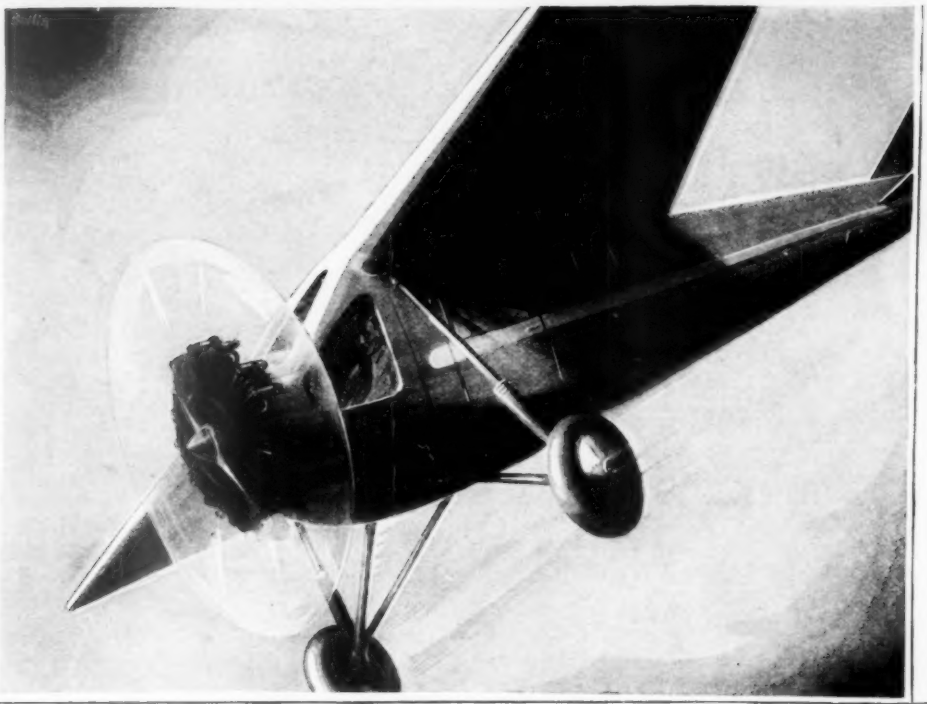

American Eagle planes are powered with motors from 40 to 225 h. p., and are priced from $1,895 to $18,895. Illustration shows the American Eagle 49 Brougham, the 4-place cabin monoplane. Valuable sales franchises are still available in certain territories to dealers and distributors.

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The new AMERICAN EAGLE line includes practically every type of plane now in demand for commercial and private use: A three place biplane—a four place cabin monoplane—a six place two motored cabin monoplane—a two place training biplane—a light sports biplane with folding wings.

It is not only because of this wide variety of models that American Eagle has attained leadership in its field. Even more than this, it is because of the *proved safety* of American Eagle planes—their long record for structural excellence. And because of their flyability and unfailing performance.

The American Eagle sales franchise has been said to offer more than any other sales contract in the industry. That is doubly true today. Certain valuable territories are still being held open for dealers and distributors. Write to us.

American Eagle 39 Phaeton, the 3-place light biplane.

American Eagle 69 Sedan, the two-motored cabin monoplane.

American Eagle 29 Flyabout, the 2-place sport biplane with folding wings.

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Lighting Air Transport Service in Germany

ONE of the most important problems in air transport service is the improvement of flying conditions in night operation, for only after night flying has been made as safe and popular as day flying, can aviation take advantage to the fullest extent of its most conspicuous point of superiority in transportation of passengers and freight, its speed. Besides the latest in navigating instruments to permit flying without visibility of land, the air transport service needs a complete system of airport and air route lighting. According to *Elektrotechnische Zeitschrift* of Oct. 11, 1928, pp. 1497-1502, a night flying service was inaugurated in Germany in the year 1926 on the route from Berlin to Koenigsberg. At intervals of about 19 miles, lights were placed along the route to permit a constant visibility of at least one light during poor weather and of several lights during good weather. These principal lights consist of a 1,500 to 3,000 watt bulb with parabola mirror, rotated by an electric motor. Between these principal lights there are auxiliary lights at intervals of about 3 miles to indicate localities, these lights consisting of Neon tubes which operate day and night and which are located on roofs or other objects if not on the ground.

The boundaries of the starting and landing runways of the Tempelhofer airport at Berlin are indicated by a line of closely placed Neon lights, so that the flyer cannot only see the airport at a glance, but prepare at once for landing; for due to the irregular arrangement of the rectangle in the field which effects a distorted view which varies at varying distances, he can determine instinctively his altitude above ground; and he may fly low above the Neon lights without interference from the light. The Neon lights at the Tempelhofer field total only 7 kw. and the Neon tubes are designed in a straight shape for the sides and in a rectangular shape for the corners. Neon lights are used also to indicate obstructions and when serving as such indicators, they are placed on smokestacks from which they may be hauled down for occasional cleaning by aid of a special carriage. A well-known Berlin publisher has provided Neon lights around the window frames of the windows in the tower of his printing plant to guard aviators against this obstruction and also to direct them in their flight, for obstructions may serve suitably also as landmarks. Direction of wind may be indicated at night by means of T-shaped signs made visible by suitably arranged Neon tubes to show their outline.

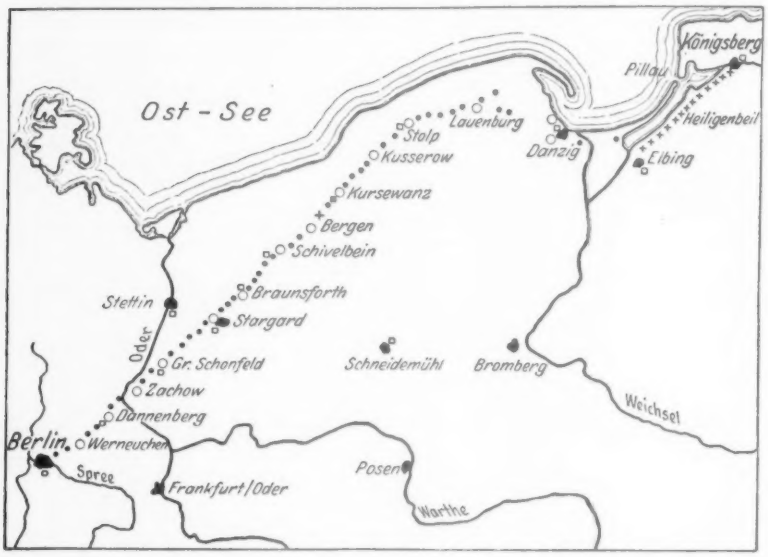

Fig. 1. Map showing lighting service maintained along the Berlin to Koenigsberg Route.
Solid dots—auxiliary Neon lights.
Outline dots — principal rotating lights.
Square dots—landing fields.
Crosses—oscillating lights.

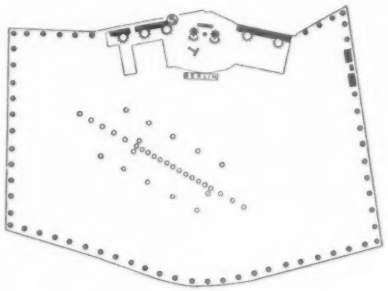

Fig. 2. Plan of the Tempelhofer Airport, showing Lighting Equipment for Night Flying Service.
Stars—red plane parking lights.
Solid dots—Neon lights for showing boundaries.
Outlined stars—lighting of space before hangars.
T-Sign—wind direction indicator.
S-sign—light projector.
Outlined dots—landing lights and storm lights.

An Echo of the Italia

In going through the different accounts of what happened to General Nobile's dirigible, the Italia, on her return voyage from the North Pole last May, and more particularly, of what happened to certain members of the expedition, one is bound to draw disturbing conclusions. Whether the specific charges lodged against Captain Zappi by Maurice Parijanine in his book The Krassin are true or not, there seems no reason to doubt that the air of mystery which surrounds the effort of Malmgren, Mariano, and Zappi to reach civilization conceals a group of very terrible facts which have, up to the present time, been suppressed with rather indifferent success. The chief reason for meddling with them now is this same continued attempt at concealment on the part of those whose re-

(*Continued on page* 68)

Fred Foote of LIFE *buys a* COMMAND-AIRE

FOR some time Fred Foote, Co-Western Manager of Life, has been selling space via airplane. We led him forward in Time January 27th and said: "Gentlemen: Mr. Foote—give the boy a hand."

Overnight Mr. Foote rises from the distinction of selling space via plane to the super-distinction of selling space via Command-Aire airplane.

For Mr. Foote has just contracted for a Command-Aire equipped with a Wright J-6 150 H. P. motor and with all the gadgets and luxuries which Command-Aire modishness dictates.

Command-Aire takes particular pride in Mr. Foote's purchase of a Command-Aire because it is a discriminating purchase. A licensed, experienced pilot, Mr. Foote looked the market over thoroughly and among 39 approved types selected Command-Aire.

It all started, doubtless, with the inherent stability of Command-Aire—a stability which, as the picture shows below, permits the pilot to leave the controls and straddle the fuselage while the plane flies serenely and unerringly forward. This is in no sense a stunt but an everyday test of Command-Aire stability.

What we have proved to Mr. Foote, we can prove to you. Just write.

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The Air Era

By Major C. C. Moseley
Vice President, Western Air Express, Inc.

Major C. C. Moseley.

AT the outset, please allow me to define two terms. "Air Passenger" must be taken to mean aerial passenger transport, and its usefulness and probable success has been demonstrated to a point where we may talk of it in a rather comprehensive and positive way. "Air Freight Service" has not been demonstrated—either here in the United States or in Europe—and it can be spoken of only in a futuristic way, but the vision of what that future holds is filled with many possibilities.

Engineers, of course, are accustomed to deal with facts and figures, and these facts and figures illustrate the point that proves the case. I venture to say, however, that no great engineering problem has been solved without a background of investigation that borders upon the romantic.

Inspired Struggle

I do not mean the romance of the heart or of the soul. I do mean the romance of the brain and the hand, and the struggle of a mentality oftentimes absolutely inspired to accomplish a certain result. What has been accomplished in the way of aviation has come about as a result of the combined efforts of the finest engineering skill known to the world backed up and inspired by faith in the certainty of aeronautics. The problem the airplane engineers have solved is not new. It is as old as history. Its solution has come within the memory of the present generation, but the seeking of that solution is as old as the centuries.

You can delve back into history, to 400 B. C., and find that Euripides in the writing of his historic classic, "Iphigenia," dreams of soaring through the air. That was approximately 2300 years ago. And at that time Euripides wrote:

"Till, distinguishing from afar,
My dear country rose in view;
Then quick descending from my airy height,
My pinions would I close, and stay my flight."

You may trace the story down through the centuries, through Greek mythology and the myths of many peoples and find that always they were talking of flying.

You may look back into the mediaeval days and into the period of Columbus and find that Leonardo DaVinci, the great engineer and artist, designed an airplane. Fortunately for the history of art he did not attempt to fly it himself.

Always people have been talking of flying. They have talked so well and in more recent years they have builded so well that we in the aviation world no more speak of flying. We let the airplane do the flying—and it does. We human beings, pilots, mechanics and passengers, travel by air.

In the United States our aerial passenger service has been built upon the success of the air mail transport. In Europe, aerial passenger service came as an outcropping of the great world war, and it was supported as a necessary war measure.

The war taught the people of Europe to fear and to love the airplane. They came to know the airplane and to appreciate its value both as a friend and foe. They grew accustomed to this modern transportation machine and they became accustomed to the thought of traveling by air.

Here in the United States we read of the exploits of the airplane; we read, but we did not feel; we did not realize its power; we did not become accustomed to it.

After the war the governments of Europe fostered the establishing of regular air passenger lines by granting huge subsidies. These subsidies still exist. I believe that only one foreign air passenger company has paid its own expenses. The others have been maintained by grace of the generosity of the government treasury.

From a purely transport angle, these European lines have proved a marked success. They have maintained a regular schedule, they have carried thousands of passengers, they have proved of great value to business interests and they have established a sound record for reliability.

No Subsidies

The American government has established the policy of not granting subsidies and the aviation industry here has progressed on a foundation of service performed. Our government, however, has not been lacking in its support of aviation; on the contrary, it has been extremely friendly. The government, as a matter of fact, has done more for the cause of aviation than any one person, or group of persons, and its assistance is being felt constantly by the industry.

The Army and Navy have consistently encouraged our aircraft manufacturers to build the finest planes and they have demonstrated these planes with such success as to win the plaudits of the world. The Department of Commerce has an aeronautical department that functions splendidly. It has aided in the testing of new inventions and its facilities, through the Bureau of Standards, have been at the constant service of those seeking to promote the welfare of the aircraft industry. It has established beacons for the guidance of pilots; it has fostered the enacting of laws for the licensing of planes and pilots, it has assisted in the establishing of airports; it has struggled mightily and well to make the people of the United States air-minded.

Air Mail Impetus

The Postal Department by establishing the air mail service gave a tremendous impetus to the cause, an impetus to which can be directly traced a great part of the progress in aeronautics that has been made during the last ten years.

It is fitting in writing of recent aviation advance to pay tribute to Colonel Charles A. Lindbergh, to Byrd, Wilkins, Chamberlin, Kingsford-Smith, Ulm, Goebel, Haldeman, Elder and the others, whose personal exploits have won the admiration of all people, and to praise the Daniel Guggenheim Fund for the Promotion of Aeronautics whose millions, under the careful direction of Harry F. Guggenheim, have consistently been used for the betterment of aircraft and air transportation. It was the Guggenheim

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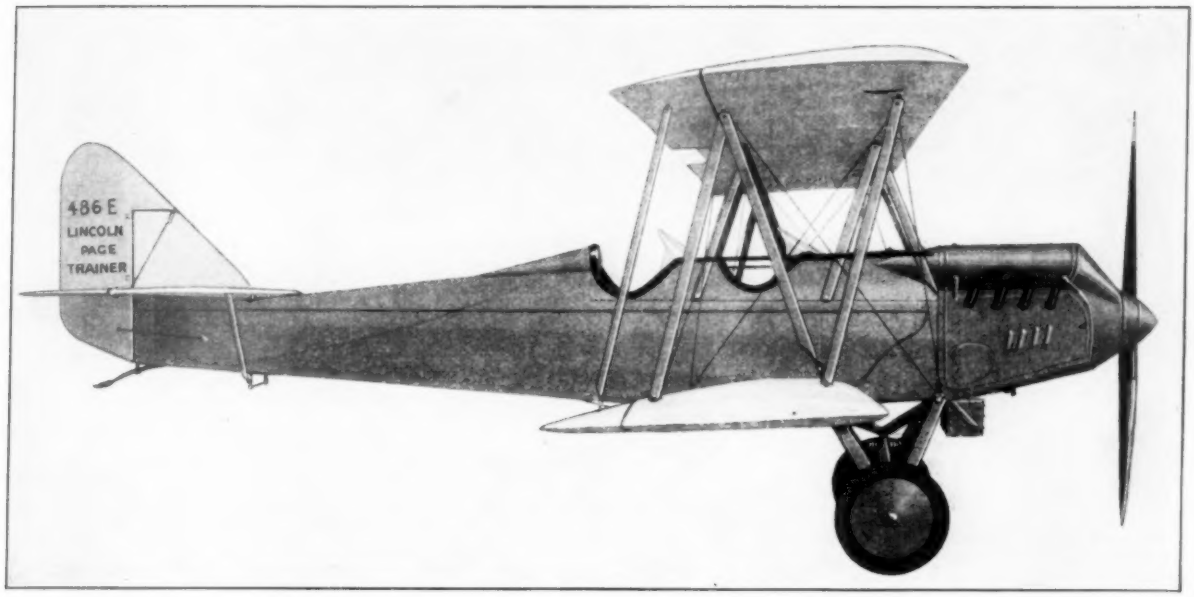

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Fund that financed Colonel Lindbergh's tour across the continent to South America. Its agents have studied all the air lines of Europe and all the airports and its findings and its services are at the service of our people without charge.

In California the Guggenheim Fund has expended more than $150,000 in the establishing, with the cooperation of the Weather Bureau, of a model air report service for the guidance of aviators. That service, designed to be a model for all the nation, is at the service of all pilots without charge. It was the Guggenheim Fund that supplied to Western Air Express, Inc., three 12-passenger, tri-motored Fokker monoplanes, under an equipment trust contract, for the establishing of a model air passenger line between Los Angeles and San Francisco. The intent was to prove that an air passenger line could be operated on an exact schedule and could, without the assistance that would come from the handling of air mail, be made a financial success.

"On Time" Schedules

The demonstration has been successful. We have operated the big planes daily between Los Angeles and San Francisco with an on-time schedule rivalling that of the finest railroad. We have made the trip in three hours, whereas it takes the train 13 hours to cover the same distance. Financially, the problem has been somewhat more difficult, but the people are steadily having more and more confidence in the service and our financial success is secured.

My own company illustrates the case, first as to what the Guggenheim Fund has been doing, and secondly, as to what can be accomplished in the way of air passenger transport. If we can operate a passenger line successfully between Los Angeles and San Francisco, similar lines can be operated successfully in other parts of the nation. Mr. Guggenheim selected us to make the test and success has been attained.

Around the World Daily

The air mail service was established in the United States by the Post Office department a little more than 10 years ago and its growth has been the most rapid in the history of all transportation. Started first as an experiment, it has spread until planes in the air mail service are now daily flying approximately 27,500 miles—or more than once around the world—and a population area of more than 65,000,000 people is being directly served.

There are approximately 36 regularly established air lines in the United States. I qualify the statement with the word approximately because new services are being established so frequently. The great majority of these lines are engaged in the carrying of air mail. Most of these also carry passengers, some also carry express. There are five or six lines devoted exclusively to the carrying of passengers and express.

With the reduction of air mail rates effective August 1 of this year, there came an immediate increase in the air mail load. As a result the more important operators are arranging to place bigger ships in service. One company has ordered 25 new and bigger planes; my own company has ordered 12 big ships; another has ordered 10; still another has ordered five—and all these orders have been placed with the purpose of carrying more passengers as well as more mail, and all of them are for multiple-motored cabin planes which will make air passenger travel more pleasant than it has been heretofore in smaller, open planes.

Next Month: Further-Faster-More Often, by John C. Nulsen, Vice President and General Manager of Mahoney-Ryan Aircraft Corporation.

There are more airplanes in use in the United States now than in any country in Europe; there are more aircraft factories in this country than there are automobile factories. This year more than 5,000 planes will be manufactured in the United States. Compare this with the fact that there are less than 5,000 pullman cars in use in this country, and you may visualize the coming spread of air passenger transport.

Certainly there is no sensible reason why air transport companies in the United States should not carry as many passengers as the air lines in any European country. The distances here are greater, our people are comparatively more wealthy and sometimes we like to think that we are a little more progressive than our European brothers.

Europe's Accomplishment

Let us glimpse, then, for a moment what has been accomplished on the other side of the Atlantic. The figures I quote are for the year 1927—the latest available. They deal only with commercial planes operated in regular service.

During the year 1927, airplanes in Austria flew 245,043 miles and carried 4,274 passengers; in Denmark airplanes flew 116,708 miles and carried 1,630 passengers; in France airplanes flew 3,755,369 miles and carried 7,799 passengers; in Germany they flew 5,921,593 miles and carried 102,681 passengers; in Great Britain they flew 873,000 miles and carried 20,344 passengers; in Italy, 824,474 miles and 12,517 passengers; in Netherlands 813,510 miles and 12,816 passengers; in Poland, 654,873 miles and 8,160 passengers; in Sweden, 206,766 miles and 14,069 passengers; in Switzerland 459,720 miles and 10,823 passengers; and in Czechoslovakia, 257,888 miles and 4,233 passengers.

We Exceed Europe

An examination of those figures will show that the airplanes of France, Germany and Great Britain during the year 1927 flew just about the same distance covered in 1928 by airplanes in the United States engaged in the air mail service; also that all the countries named during the year carried only 2,628,547 pounds of air mail, which is less than the total of air mail carried in the United States during 1928.

The airplanes of Germany have a daily mileage average of 33,000. Germany is the only country in the world that exceeds the daily mileage average—27,500—now maintained in the United States and before the close of this year it can be predicted that our mileage will exceed that of Germany.

The second greatest European mileage is shown by France—22,500 miles daily. We already exceed that.

As I said above, what Europe has accomplished in the way of carrying passengers by air we can do here in the United States. We already exceed all European countries in the transport of air mail. Our regularly established air lines cover approximately two-thirds of the distance flown by all air lines in European countries and our aerial services are being expanded constantly.

People Must Be Convinced

The great problem of those of us engaged in the air transport business has been to convince the people that the airplane offers a reliable means of travel. We cite records to show that in commercial aviation in the United States last year there was only one fatality to every 1,240,000 miles of travel; we cite figures from numerous commercial air transport companies to show they have never had a fatality, lost an ounce of mail or wrecked a plane. But the figures do no good. The same day the public will read in a newspaper that a stunt flyer has cracked up, or a student flyer has been smashed up, or perhaps some daring aviator has been lost in an attempt to fly across the Atlantic or over the North Pole.

Previously they may have been convinced they would be safe if they could keep one foot on the ground. After the

(*Continued on page* 53)

XUM

MONOPLANES CESSNA

Two planes take off—their motors alike—the same pay-load—the same destination,

They're on their course—motors turning over the same R.P.Ms,

But look! One is pulling steadily ahead of the other—it's fast gaining,

It's riding the rough air-currents better, too—seems to be just gliding along;

Soon it fades away into the distant sky—and then, hours later the report comes in—

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That's the story of CESSNA PERFORMANCE—repeated almost daily wherever Cessnas fly

—it's the story of Earl Rowland and his victory from New York to the Coast; the story of Stanton in Miami, and many others,

—and through it is woven the story of Clyde V. Cessna himself—Pioneer Plane Builder. It's a long span from that weird contraption which he fashioned 18 years ago—but which did fly—to the luxurious CESSNA of today—his 15th model—

But Cessna Performance today is proof that there *is* no substitute for experience, and those years of experience have made the CESSNA—Model 15

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A Caution to Investors

By R. D. Small

General Manager, Aviation Financing and Trading

INSTEAD of the usual discussion of specific securities, this article will be devoted to looking over what has occurred in the aeronautical industry largely within the last twelve months; to some reflections and suggestions as to a future attitude toward aeronautical investments; and to a very frank recognition of some undesirable equations that have appeared in the situation.

We repeat a much quoted statement of Mr. W. P. McCracken, Assistant Secretary of Commerce for Aeronautics. Mr. McCracken claimed that "within the last three years the market value of aviation securities had increased from a level of $5,000,000 to more than $1,000,000,000, which is a record to which nothing in the financial history in the United States is comparable."

Time to Readjust

These figures indicate an avidity on the part of investors that has not always been coupled with caution. As many bankers claim, it seems a fitting time to readjust the public mental attitude, or a large proportion of the present-day security purchasers will have a severe headache at the end of 1929.

Here are a few examples of things that should not be encouraged, or even tolerated. A recent stock offering was made in terms of a one dollar par security. The stock was advanced to $6.00 a share within a few weeks after the offering. A considerable part of the unthinking public will buy stock at $6.00 a share—because it is cheap, not taking the time or pains to discover that they are paying someone a 600 per cent profit, in less than a month after the stock offering. This kind of scrambling for any security registers a want of poise, intelligence, common sense, that entitles the victim of such procedure to no sympathy when he finally calms down, and realizes that nothing short of a miracle could have made that particular stock worth six times the promoter's offering price, within a period of thirty days. The psychology of establishing a $1.00 par, with the ease of "kiting" the shares to a 600 per cent appreciation, might be considered very clever, but we think it is a tendency that should be curbed at once for the good of the industry at large, as well as the investing public.

Another method of exciting an intending investor in aeronautical securities is to dramatically stress the small amount of shares outstanding. If the investor would hesitate and think for a moment—the paucity of available trading shares confers no real value to the security involved. It does, however, become a hand made, ready to work with tool for a promoter or "stock-rigger" to manipulate the shares to an undeserved market level, simply because there are only a few shares to take care of and it costs little to advance the market.

Advances Through Shortages

In the last sixty days there have been three sharp instances of advancing values that obviously occurred solely through a shortage in available trading shares. A word of caution to the prospective investor may not be out of place at this time. Do not buy your stock because it can be put up, because nothing of value has been added. It is merely a technical situation which can develop into a toboggan slide when the manipulators have sold their stock.

A swing on the part of aeronautical investors to the stockholding type of companies has been emphasized within the last ninety days. A point will soon be reached where the inquiring purchaser will demand more information as to the values in the portfolio of the investment holding company. Thus far only one of these companies, Aeronautical Securities, has given any publicity to the shares that were held. With almost all other corporations of this character the stockholder must either guess what investments are held or largely buy on faith. It should be said that such concerns as National Aviation, North American Aviation, Aviation Securities, Aeronautical Securities—and the various other local Aviation Securities companies that were all more or less founded on the same model and are inter-related—have shown a selection of officials and directors that justify high expectations in point of the integrity, ability, and experience of the men at the helm.

Stricter Requirements

We were advised recently that governmental authorities are now exercising a more severe procedure before an airplane manufacturer can secure a certificate for his product. This is a tendency for which we should all be thankful. Several companies that expected certificates months ago are still waiting. We have just been informed that one company that had been making planes for very nearly a year has had its certificate withdrawn. Structural weaknesses were divulged in a recent smash-up. The large number of inexperienced, would-be manufacturers who are hurrying into this new industry with the idea of merely making a cheap plane with which to undersell present accredited production represents a condition that all friends of the industry must deplore. It is claimed that there are over 80 companies now making or planning to manufacture planes between a price level of $1,200 and $4,000. The competition and the resultant mortality in the so-called cheap planes is expected within the next year and a half to be highly distressing. This condition does not manifest itself in the large plane industry for the obvious reasons that it requires more money, more real engineering personnel, more organization, and more thorough information to construct the transport or commercial craft than it does to evolve a small something that looks like a plane, because it has the general outlines of one, and has a propeller on its nose.

Spreading Misinformation

There is a wide accumulation of misinformation that is being spread broadcast in aeronautics that reflects no credit to the companies who wilfully misstate the performance of their planes, or the magazines who permit such misstatements to appear in their columns. We read in a highly representative aviation periodical that a certain small manufacturer has just put out a plane with a top speed of 200 miles and a landing speed of 50 miles. In this particular instance we happen to know something about the project through an engineer, who had inspected the job. The real top speed of that plane was, is now, and probably ever will be, 135 miles an hour, "gales on the tail" excepted. One of the sound, thoroughly experienced and internationally known pilots remarked recently, "I used to accept most of these advertisements and press notices with a discount of from 10 to 15 per cent. I am now beginning to believe that if I deduct 40 per cent of all performance figures given I will not even then get the true picture." It makes little difference whether an automobile salesman claims his car has a top speed of 85 miles per hour when it cannot reach 65, because no real harm results. It is a disappointment which does not jeopardize a life. Expected but unobtainable reserve power in an airplane,

(*Continued on page* 50)

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Monthly Financial Review

By J. Allen Grover
Pynchon & Co., New York City

DURING the last month there has been an unprecedented activity in aviation financial operation, although most aeronautical stocks have reflected the hesitancy of the general market induced by the uncertain credit situation.

At the moment of going to press, the credit problem has eased, but the next three weeks (end of March and first of April) still present difficulties to be solved. The confidence shown by the public in the market recently is a hopeful indication that the Reserve System will handle whatever stringency may arise in a manner which will insure business its due amount of credit at reasonable rates and will not pinch the stock market for its necessary funds.

Healthy Features Apparent

As aviation finance becomes more general, certain peculiarly healthy features of the industry are apparent. For one thing, the manufacturing companies offered for sale to the public are nearly all going concerns. That is, most of them are private organizations which have been in production some years, but because of the increased demand, need capital to expand. There are almost no records of companies offering stock to raise money to build planes or motors which are not already known to the trade, as was the case in the early days of the automobile industry. Then, too, the character of the financing has been extremely simple. Companies are formed today which have as their sole liability an issue of common stock of no par value with a few instances of a small issue of preferred stock ahead of the common. Funded debt is practically unknown and the complicated structures which we find in railroads and public utilities are not existent in the aviation industry.

Follow the Mergers

These facts warrant an optimism for aviation which might not otherwise be justified during this period of expansion and development. It is inevitable that many of the small producers will fail and the eyes of the investor should follow the course of mergers and consolidations, because it is only through such developments that really strong successful units will be evolved.

Allied Aviation Corporation: This is a $5,000,000 holding company which has purchased the Lambert Aircraft Corporation, the Mono Aircraft Company, the Aviation Accessory Corporation and the Hurricane Aircraft Engine Company. No financing has been mentioned at the present time. The company represents the Lambert interests of St. Louis who have long been prominent in aviation and the aeronautical activities of the Velie Motor Company of Moline, Ill.

The Aviation Corporation: This company is the largest aviation finance organization yet to be formed. There is an authorized capitalization of 10,000,000 shares of no par common stock, of which 2,000,000 shares were offered at $20 a share by a syndicate headed by Lehman Brothers. The company's charter includes a wide variety of powers ranging from those of an investment trust to a management company and financial agency. So far no definite acquisitions have been made by the Aviation Corporation, although numerous rumors have been current that the company had purchased control in several operating and manufacturing companies.

Another Investment Trust

Aviation Corporation of California: This is another company formed as an investment trust and incorporated under the laws of Delaware. The capital stock consists of 300,000 shares of no par value common, 100,000 of which are outstanding. There are also 100,000 shares under option to the Bankers on an ascending scale of prices. The stock was offered at $25 a share by Hemphill, Noyes & Co.

Aviation Securities Corporation of New England: This is a company formed by Massachusetts bankers along the lines of a general investment trust. The authorized capital is 250,000 shares of no par common stock, of which 150,000 shares were offered by Hayden, Stone & Co. and associates at $23.50 a share. The 100,000 shares not outstanding are under option to the organizers until 1932 at a figure which is not made public.

Berliner-Joyce Aircraft Corporation: This company was recently formed under the laws of Maryland and 50,000 shares of no par class A stock were issued through Burden & Burden of New York at $20 a share.

Brunner-Winkler Aircraft Corporation: This is a manufacturing company incorporated in Delaware which was financed through the sale of 50,000 shares of no par common stock at $15 per share by Marlin S. Emery & Co.

Inter-Allied Aeronautics, Inc.: This is another general aviation finance company incorporated in Delaware and having on its Board of Directors a number of men prominent in technical aviation problems, as well as bankers. The charter of the company is very broad and while the organization is too new to warrant lengthy comment, it is expected that it will acquire companies for operation as well as an interest in the securities of various successful enterprises.

One of the Oldest

Irving Air Chute Company: A syndicate, headed by Hornblower & Weeks, has purchased this business, which until then was privately owned, for a reputed price of $4,000,000 and has sold the company to the public. 120,000 shares of no par common stock were offered at $25 per share. There is a total authorization of 300,000 shares, of which 200,000 are outstanding. The company is the oldest and best-known manufacturer of parachutes in the world. Its products are used by the military aviation services of practically every country, and with the development of flying schools and airmail routes, it seems reasonable to suppose that the company must develop in line with the aviation industry as a whole.

New York Air Terminals, Inc.: On March 5th, Hayden, Stone & Co. announced that a syndicate, of which they were the head, had purchased 743 acres of land in the New Jersey meadows between the Pennsylvania Tunnel and Manhattan Transfer, to be developed into an airplane and seaplane port for New York City. The company was privately financed through the sale of 250,000 shares of no par common stock, which are closely held and in which no public market exists. The bankers state that $3,000,000 is available at the present time for development work on this proposition which will begin within the next four or five months.

An Airport Offering

Roosevelt Field, Inc.: This famous Long Island field, together with Curtis Field which is adjacent to it, has been purchased by a syndicate headed by Mr. Seth Low for a reputed price of $2,500,000. A group of bankers, headed by E. B. Smith & Co., has offered 300,000 shares of no par value common stock at $18 a share to finance developments which will make these fields comparable to the great European airports in every

(*Continued on page* 50)

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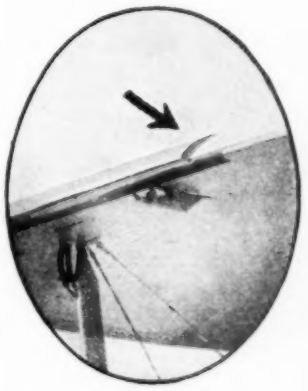
WHEN you sell and fly the Whittelsey Avian you have something to talk about. No other light plane has such a background of achievement. No other light plane offers more attractive features.

Economy of Operation: 20 miles to gal. of gas; 500 miles to gal. of oil. *Speed:* Maximum, 102 m. p. h.; cruising, 85 m. p. h.; landing, 35 m. p. h. Ceiling: 17,000 feet. *Cruising Range:* 5 hours or 430 miles. *Weights:* Light, 875 lbs.; aerobatics, 1475 lbs.; top, 1600 lbs. *Dimensions:* Wing span, 28 ft.; width folded, 9½ ft.; height overall 8½ ft.; length overall 24 ft.

Power Plant: Cirrus Mark III, 95 h. p. air-cooled, four-cylinder in-line aircraft engine. Famous for economy of operation and maintenance. Top over haul at 200 flying hours.

Price: Only $4995, Fly-away, or F.O.B., Bridgeport, Conn.



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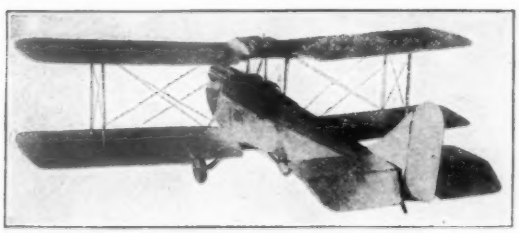

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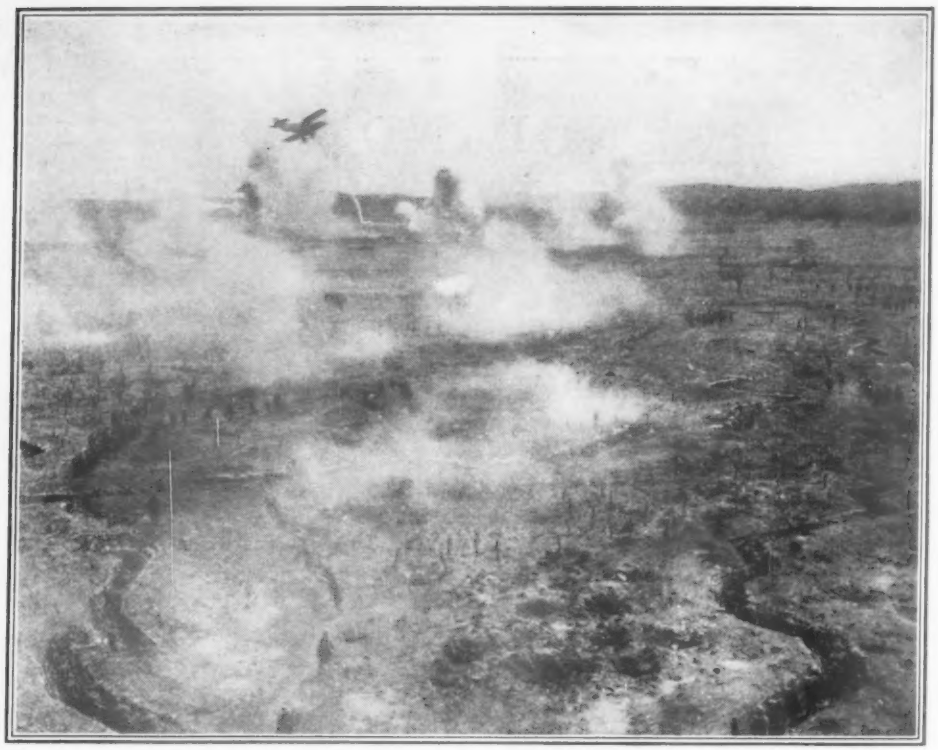

How High Is Up?

By Lieut. Earl H. Robinson

A Forced Landing Story

AS an author I am probably a good pilot; but, being gifted with that adventurous spirit (or is it spirits?), I'll try anything once, even to the extent of two airplanes complete with motor, washed out. If your belt is fastened and you have a firm hold on the longerons, we will give 'er the gun.

In September, 1926, after a year's long, hard struggle, the Faculty Board of the Air Corps Advanced Flying School at Kelly Field decided that inasmuch as our allotted time was up and we were still not washed out, the best way to get rid of us was to graduate the remaining handful of what at one time had been a large and ambitious class of Flying Cadets. Immediately following an Aerial Review we donned our new gold bars and repaired to the allotted place and, after hearing many speeches complimenting us upon our perseverance, received our diplomas and wings.

The class song now became "Where Do We Go from Here?" Some decided to stay in the Air Corps; others returned to the old home town, and still others, undecided as to what they wanted, were in a flat spin or were doing a little mental ground looping. Among the latter was yours truly.

It was at this time that Providence intervened by sending the Paramount Film Company to Kelly Field to film their b-b-big epic of the air, "Wings." Here indeed was my golden opportunity to get into that industry where a three-motored transport was needed to carry home the weekly salary. Several weeks later found me on the payroll. But alas! Some one had misled me. A Sperry Messenger Plane, which fits me like a pair of Peal boots, would have been sufficient to ferry the income, as long as the gas held out.

Nothing Ordinary

The best flyers of the Air Corps were gathered in San Antonio to make this aforementioned opus, and in the five months that followed I was to learn many things about flying that two years of ordinary piloting could not have taught me.

Not a day passed that didn't bring some new experience. Very amusing, now as I look back at them, but very uncomfortable at the time of their happening.

One incident in particular is vividly recalled to my memory as I sit here laboriously picking away at my typewriter watching the majestic cumulus clouds piling up over the Sierra Madres.

After waiting all day for clouds that were needed in one particular scene, we were finally rewarded by seeing them starting to form at about five-thirty in the afternoon. We immediately made preparations to take off. I had a Martin Bomber with two camera men and their cameras, while the ships to be photographed were fast single-seaters.

Climbing steadily we soon encountered the first layer of clouds at about 4,500 feet. Upon getting above them we found the light was insufficient to take the scene, so we proceeded to climb to the next layer. I reached these at an altitude of about 8,500 feet. The old Martin was beginning to get loggy now. We found there that by flying northwest a beautiful background could be obtained for our shot, so I headed the Bomber in that direction and signaled the pilots of the other ships to carry out their maneuvers as prearranged. Through some misunderstanding of signals it was quite

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by Alexander Klemin, Prof. of Aeronautical Engrg., Daniel Guggenheim School of Aeronautics, N. Y. University. **277 pages, 105 illustrations, Price $7.00**

Shows, step by step, how to make all the calculations in the airplane stress analysis required by the Department of Commerce. Each point is explained with the utmost clearness and simplicity; advanced mathematics has been avoided so far as possible. Explains the principles of applied mechanics involved and develops the formulas that furnish the foundation for stress calculations. Takes as an illustration an airplane of average characteristics and gives full examples of all the computations required. Supplies in concise, easily usable form, all the data on materials of airplane construction to which the calculator must frequently refer.

Aircraft Float Design

by Captain Holden C. Richardson, formerly Chief, Design Section, Bureau of Aeronautics, U.S.N. **111 pages, 97 illustrations, Price $5.00**

Gives the designer and student a great fund of information never before obtainable. Reviews the effects of different shapes and combinations—includes records of some failures when these disclose little known or novel phenomena of importance. Treats design from the viewpoint of form arrangement and proportion; performance; and use of model tests.

Practical Flying

by Major B. Q. Jones, Air Corps, U. S. Army. **210 pages, 6 illustrations, Price $3.00**

Experienced airmen enthusiastically endorse this new training manual for airplane pilots by a veteran Army flyer and instructor—they say it will save many crashes and lives. It describes all the parts of a plane, instruments, etc.; maneuvers in the air; and explains technical expressions and slang terms. Covers practical subjects like: the most useful instruments for each class of flying, particularly "blind" flying; why a magnetic compass spins during fog flying; "dead stick" landings; causes of crashes during take-offs and turns for landings; how to recognize stalls in time and how to get out of them easily; suggestions for progressive lessons right up to the license flight, etc., etc.

Aircraft Instruments

by Herbert N. Eaton, and other experts of the Aeronautic Instruments Section, United States Bureau of Standards. **269 pages, 68 illustrations, Price $5.00**

Describes more than 175 types and makes of aircraft instruments. Gives not merely mechanical explanation of each instrument but also a summary of the principles upon which it operates. Among the instruments described are altitude, attitude, air-speed, and engine revolution indicators; oil and radiator thermometers, gasoline gauges, earth inductor compass, sextants, banking indicators, etc., etc. Provides practical information on installation and maintenance of instruments which will prove particularly helpful to airplane mechanics.

Elements of Aviation

by Colonel V. E. Clark, formerly Chief Aeronautical Engineer, U. S. Army. **193 pages, 24 illustrations, Price $3.00**

Will give you a clear understanding of the fundamental reasons why an airplane flies, why it is stable or unstable, controllable or uncontrollable in various attitudes and conditions—in short, "why an airplane does what it does." Its explanations are simple but absolutely authentic. It will help the beginner learn more rapidly and to become a better and safer pilot. The veteran flyer will find in its pages an explanation of many questions regarding the behavior of a plane that may have bothered him. The flying instructor will find here simple but thorough answers to many of the puzzling questions that his students ask.

Aircraft Power Plants

by E. T. Jones, Chief Power Plant Engineer, Wright Aeronautical Corporation, and other experts. **208 pages, 104 illustrations, Price $4.25**

Explains and compares favorable and unfavorable features of engines and accessories, also performance characteristics of each. Points out adaptability for specific purposes, with practical notes on operating features, including balance and cylinder arrangement. Accessories described include ignitions systems, carburetors, fuel piping, pumps, reversing mechanisms, superchargers. Valuable information on lubrication and quality of engine fuels; section on design and construction of propellers.

Aeronautical Meteorology

by Willis Ray Gregg, Senior Meteorologist in Charge of Aerological Division, United States Weather Bureau. **144 pages, 44 illustrations, Price $2.50**

Furnishes information needed to understand weather maps at a glance and for applying local observations in forecasting prospective flying conditions. Covers weather forecasting from clouds; average height of clouds of each class; variation in direction and velocity of winds with change of altitude; frequency of winds from each direction at various altitudes; characteristics and dimensions of thunderstorms; general circulation of the atmosphere; visibility; instruments and methods of observation; cyclones and anti-cyclones, etc.

Engineering Aerodynamics

by Lieut. Walter S. Diehl, (C.C.) U. S. N.; Scientific Section of Bureau of Aeronautics; Member of Aerodynamic Sub-committee, N. A. C. A. **288 pages, 159 illustrations, Price $7.00**

Contains a large amount of selected new data in the form of working diagrams and equations supplemented by detailed instructions for use. Supplies a carefully selected theoretical treatment, starting with the fundamental laws of hydrodynamics and leading up to the modern theories of lift and drag. Explains circulation, vortex theory, induced drag, etc. Theoretical equations of motion are developed for many problems in rectilinear and curved flight. Gives data on standard wing sections and explains how a section may be selected for a particular purpose; parasite drag data for a wide variety of shapes; methods for conducting wind-tunnel tests and interpreting test data; shows how flight tests are made and reduction of observed data to standard conditions, etc., etc.

Airports and Airways

by Lieut. Donald Duke, formerly Chief, Airways Section, Army Air Corps. **178 pages, 67 illustrations, Price $5.00**

Shows how to select a site for an airport, considering such factors as drainage, prevailing winds, accessibility, surface transportation, etc. Illustrates points with aerial photographs, charts, and tables of practical value. Information on types of mooring towers, hangars, buildings, and additional equipment needed, together with construction cost data.

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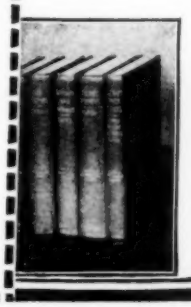

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some time before the other ships got in their proper positions.

During this time the peaks of the clouds had been rising, which necessitated my climbing continuously. As a result I ultimately reached the ceiling of my ship, about 11,000 feet. From time to time I encountered peaks of clouds rising in my line of flight, and, while the other ships easily flew over them, I was required to either go around or through them. Both of my motors were very cold, to say nothing of the young Lieutenant, the temperature at this altitude being somewhere in the vicinity of zero Fahrenheit. Encountering one very large peak I started through it while the other ships went over or around. When nicely enveloped by this beautiful model for an artist's painting, one of my motors, due to its coldness, gave a couple of coughs, a loud sigh, and died. I immediately throttled the other one and started into a glide, deciding to call it a day and glide down to warmer area below the upper and lower layer of clouds, where my motor would pick up again, and I could go happily on my way back to Kelly Field, which by this time was a number of miles to the south.

Disillusioning Clouds

In a few minutes I realized that it would be impossible to do that, as we had evidently dropped into one of those cumulus clouds that look so beautiful on the outside and are so disillusioning to wandering aviators who enter them.

My goggles were soon covered with ice and frozen to my face and, what was worse, my mustache, of which I was quite proud, was a mass of icicles. Unable as I was to see the instrument board, with no sunlight penetrating the density of the cloud, it soon resolved itself into a game, with me holding the bad hand. I was completely absorbed trying as best I could to keep that big crate from getting out of control. Before long I got courage enough to try spiraling. The

The winner of the May Forced Landing award of a Longines Chronograph—Lt. Earl H. Robinson.

two camera men, one in the rear cockpit and one in front of me, had huddled down out of the storm—not a bad idea!

After a while it got warmer and the sleet changed to rain; lifting my goggles I began watching my instruments. Having by this time lost some four thousand feet, I watched the altimeter dropping. Six thousand—five thousand—four thousand—three thousand—

The territory over which I assumed we were I knew to be mountainous and naturally of considerable more altitude than my starting point. Realizing full well that this storm was probably right down on the ground, I decided that if we didn't sight land before long we would have to jump and use our 'chutes. Calling to the two camera men I apprised them of the situation and stated that if land was not sighted by the time the altimeter read 2,000 feet we were all going to try a "Brodie" over the side. Much to my amusement they said, "O. K., we'll watch you and then try it ourselves." I told them, however, that it would be much better for them to leave while I held the ship level, and that I would probably get clear with much more ease than they would find possible. And so it was agreed.

You see—in the movies they pay you for this—if you do it in front of the camera.

Ready for an Annette

When the altimeter reading had descended to 2,200 feet, I started preparations for my "Annette Kellerman"—threw my goggles away—unbuckled my belt—checked my parachute—and called to them to do likewise. Taking a last look downward, before leveling off and giving the word that was to send them into that unknown void below, I got a fleeting glance of what appeared to be land. Shoving the nose well down, the ship came out in the clear, approximately 500 feet above the ground. It was dark and still raining, but I distinguished the lights of a small town directly beneath us. One of the motors was still turning over, and with its aid I circled the town once, picked what looked like a grain field and went into it. Took down one fence and stopped just short of another. No damage to the ship.

Tramped into town, soaking wet—cold—hungry—covered with mud and thoroughly disgruntled. Discovered we were fifty miles from Kelly Field and the name of the town was COMFORT.

EDITOR'S NOTE: There is no dearth of excellent forced landing stories, but we still wish to remind pilots that here is a chance to win a fine Longines strap watch every month. It is offered for the best Forced Landing story — with photos.

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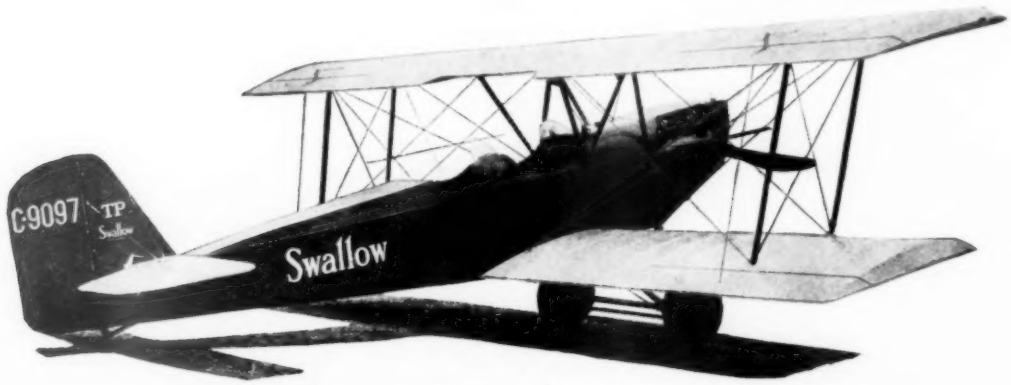

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Monthly Financial Review

(Continued from page 44)

way. Of the authorized 500,000 shares, 100,000 are to be reserved for subscription warrants to be received by the underwriters and 60,000 shares will be acquired by The Aviation Corporation which will manage the field for the owners.

More Mergers Coming

The month has been without any noteworthy consolidations or mergers, although there have been many rumors and it is entirely possible that by next month there will be news to report of several completely intergraded companies, of which there is now only one in American aviation.

The Curtis Airplane & Motor Company, Inc., and subsidiary companies reported a net profit of $1,528,782 for the year ending December 31, 1928. This was equal to $4.12 a share on the outstanding common stock.

The Wright Aeronautical Corporation declared a 100% stock dividend and placed the new stock on a $2 basis, which is the same dividend that was being paid on the old stock.

Consolidated Instrument Company of America announced that arrangements had been made for the acquisition of the Aircraft Control Corporation of Philadelphia, manufacturer of airplane motors and navigation instruments. No financing in connection with this deal was mentioned.

A Change of Directors

The Moth Aircraft Corporation announced a change in the Board of Directors which involved the resignation of four members and the election to the Board of Richard F. Hoyt of Hayden, Stone & Co., and Stewart R. Reed of Jackson & Curtis. The composition of the new Board indicates that there will be a close working agreement between the Moth Company and the Wright Company. This seems entirely reasonable as the Wright Company manufactures the De Haviland Gypsy Engine which is used in Moth planes.

Aviation interests have acquired control of the Stromberg Carburetor Company from Charles W. Steiger of Chicago. Both Richard F. Hoyt of the Wright Company and C. M. Keys of the Curtis Aeroplane & Motor Company are on the new Board of Directors.

The Lincoln Aircraft Company has secured the exclusive rights for manufacture and sale in the United States and Canada for the Wright-Morehouse engine, a power plant designed for light sport planes of the type which is the chief product of the Lincoln Company.

The quotations below give the high for 1929 and the current price of aviation stocks on the New York Stock Exchange and the New York Curb Market:

	1929 HIGH	*CURRENT*
* Curtis Aeroplane & Motor Co.	173½	154
* Wright Aeronautical Corp.	299	273
** Aero Supply Mfg. Co. A	44½	44
** Aero Supply Mfg. Co. B	43½	42½
** Aero Underwriters Corp.	48½	44¼
** Alexander Industries..	23	20¾
** Aviation Corporation of the Americas	89⅞	61½
** Aviation Corporation..	22⅞	21¼
** Aviation Credit Corp.	23⅝	21⅞
** Bellanca Aircraft Corp. of America	23⅜	19½
** E. W. Bliss Co.	57⅞	50
** Consolidated Aircraft Corp.	43	36⅝
** Curtiss Aero Export..	52⅞	44
** Curtiss Flying Service, Inc.	25	22
** Douglas Aircraft Co., Inc.	33⅞	32¾
** Fairchild Aviation Corp.	34⅞	27½
** Fokker Aircraft Corp. of America	44⅜	37
** Irving Air Chute Co..	29	26¾
** Keystone Aircraft Corp.	50	40⅛
** National Aviation	76	83⅞
** North American Aviation	19	16
** Sikorsky Aviation Corp.	63⅞	49⅞
** Transcontinental Air Transport	30¾	28
** Travelair	61	53½
** United Aircraft & Transport Pfd.	80	69½
** United Aircraft & Transport	97⅜	84⅞
** Universal Aviation	27⅜	21⅛

* New York Stock Exchange
** New York Curb Market

A Caution to Investors

(Continued from page 42)

however, may mean life or death, while in an automobile it may only be an annoyance. The glib claimer of low landing speed, fast climb, excessive ceiling, high speed, should be held to a strict accountability for his misstatements, either by the government, or some proper authority, so that his plane certificate may

be withdrawn if the claims are dishonest.

Some pilots have suggested that an impartial jury should give the real speed figures rather than to permit a manufacturer to do his own "clocking." The inclination to absolutely rely on *claimed* "high," "low," "climb," and "ceiling" should be justified in this industry, because of the hazards. More attention should be given to bringing about a higher degree of ethics on the part of manufacturers, operators, and flyers in general, when it comes to claimed and expected performance.

Consolidation Means Stability

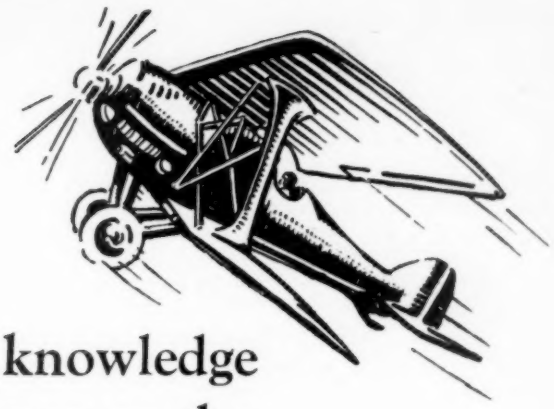
The real accomplishments and attainments in aviation, during the last three years, have been of such a splendid nature that it seems not only unnecessary, but inexcusable, to continue to permit the half-baked statements to go unchallenged, and unchecked. The real lover of flying should insist on a greater degree of adherence to facts in all selling and advertising material.

There has already begun to appear in aviation the manifestation of the tendency to weed out the incompetents, and consolidate the stronger units, that always prevails when an industry emerges from its experimental period into its practical commercial phase. A half dozen or more consolidations in the transport field, either already accomplished, or under negotiation, are evidence of a desire for greater solidarity of management, financial structure, and operating efficiency.

The Government provided an invaluable impetus to flying when it took over the development of the air mail carrying problem, and subsequently leased these operations to private enterprises. Much faster progress could be insured at this time if there could be some federal supervision over the requirements of all airports and landing fields. A standard should be set and insisted upon, and adequacy in the matter of superficial area, surface conditions, efficient signaling, relief from obstructions, lack of crowding, etc., should be maintained. We understand there are only about sixty inspectors of airports in the United States and that less than ten states have state inspectors.

Americans Fly Abroad

A much traveled observer concludes that in Europe the majority of those flying seemed to be Americans, but that when those selfsame Americans came back to their country many of them refused to fly. When asked to account for their attitude they claimed, "Well, we have a greater amount of confidence in European transport systems. Instead of overcrowded, muddy fields, with no proper ways of getting to the ships, and the inadequate waiting rooms such as we



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get in the United States, we found at Croydon, Le Bourget, Tempelhof, and other ports well posted, uniformed porters, protected passageways to the ships, comfortable waiting rooms, displaying complete information regarding the trip and full meteorological conditions over the entire route, with highly disciplined officials to signal for starting and bringing down ships. There we sensed an element of organization, experience, and soundness of operation that is frequently absent under similar circumstances in the United States."

There are many landing fields in the United States where the problem of overcrowded conditions must be met soon or disagreeable fatalities expected. This question should either be immediately handled by the municipality or rigidly supervised by the Government, perhaps under the claim that such a field comes under the classification of a harbor.

In spite of the above, many have been led, by foreign news agencies, to believe that flying in Europe is four times that which is done in America. This is not the case. From the best obtainable channels we have learned that in 1928 there were over 100,000 passengers flown in the U. S. (more than 50,000 in Transport Service alone) and approximately 200,000 in Europe.

Water Landings Practical

The recently suggested checkerboard of landing fields, ten miles apart, throughout the country, is perhaps a well meant gesture. The multiplicity of locations where a plane can "sit down" on water makes a water landing a much more practical method of solving this problem. With the rapid swing to amphibians that has registered within the last four or five months, the majority of the large cities in the U. S. can immediately provide means of reaching the heart of the city in the shortest possible space of time, landing their aircraft on a body of water within 10 minutes' taxi distance from their City Halls.

The foregoing resume presents some of the problems that are connected with the financial well being of this industry. Some stocks will continue to go up because pools or syndicates can make them go up. We feel that now is the time to strike a note of warning and caution to either the casual or chronic investor in aeronautical securities to examine more thoroughly all of the potentialities that can make or mar his investment. The management, the men behind the project, in our opinion is the first essential, and the second is adequate pilotage. Three years ago the plane and the engine would probably have been the first two requisites, but present-day statistics prove that most of the accidents are attributable to errors in judgment on the part of pilots, and that engine failures are comparatively few. Adequate landing fields are now claimed by many to be the third item of importance.

Diversified Investments

To the potential investor in the aviation stocks we suggest that he diversify his commitments in four different channels: manufacturing, transport, accessories, and security holding companies. The latter in itself embraces the suggestion of diversification. Of the approximately 125 aviation companies whose securities are presently quoted there are about twenty-four that can conservatively be expected to continue to give a good account of themselves in the next four or five years. We presented this problem of selecting the leading two dozen companies in respect to present soundness, and future potential strength, to a number of different investors in different lines of business but all experienced in aeronautics. There was a commendable degree of unanimity in their lists, and the readiness with which they eliminated forty or more companies from the picture of probable survivors in 1934.

Some of the criticisms were: over-capitalization—poor management—plenty of money but no brains—no experienced airmen in the organization—no engineering background—too much politics.

Many small plane manufacturers have entered the field without any justification. The designs of their planes offer no additional advantages through which to divert business to them, away from the forty or fifty other manufacturers of similar planes, who will all be struggling

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to sell the same purchaser. Many stocks have been put up through pool operations. They will tumble as fast as they were sky-rocketed. Look more insistently for the demonstrated and potential earning power, with relation to both shares outstanding and shares authorized, and then put the management under the microscope and see how much real aviation experience you can find in their organization. Then determine for yourself whether that particular branch of the industry promises to be unduly overcrowded with competition.

Mistakes Can Be Made

No disclosure of these two dozen securities will be given to anyone inquiring for them at present. But it is possible, however, that a complete survey and analysis of what these five successful men, well posted in different walks of life, selected as the "survival of the fittest," the twenty soundest companies of the aeronautical field in 1934, and the reasons for their conclusions, may be available some time in the next three or four weeks.

While we subscribe to the general belief that aeronautical stocks will probably, as a class, show a greater market appreciation than any other single industry in the next ten years, we also believe that chances for making mistakes in the selection of the investments will be several times greater in the next six months than they were in the last fifteen.

The Air Era

(*Continued from page* 40)

morning paper comes out they want both feet on the ground!

The same person will read about a score of automobile accidents, or a serious train wreck, or the crash of a steamer, and it will have no effect upon him. The next day, particularly if it is a Sunday, he will load the family into the old flivver and defy the traffic of the crowded highway. Or he will get aboard a train or a steamer and feel delightfully assured that all is well.

Those engaged in the business of air transport haven't a word to say against the automobile, or the railroad train, or the steamer. We feel, in fact, that they are all friends of ours, but we do want all people to realize that in air travel over established commercial routes upon which licensed airplanes are operated by licensed pilots, the safety element is as great as that in any other means of transport.

I haven't mentioned the speed of the airplane, economy in the air and the service which speed gives to the business interests of the nation, because that is common knowledge. The average airplane in commercial service travels at a cruising speed of 100 miles an hour; the train averages 32 miles per hour. The airplane will carry passengers from Los Angeles to Chicago in 20 hours, or to New York City in 30 hours. That speed has been of mighty importance to the great commercial interests of our nation and its importance is growing daily.

Will Rogers Says:

Aviation's good friend, Will Rogers, the humorist, has sagely remarked that if your time is valuable you should travel by airplane; if your time is not valuable, you might as well get out and walk. Will Rogers has travelled many miles by air and he is a splendid booster for the service; and let me add that so far as I know Will has never had a free ride in an airplane. He has paid his way all the time and because of that we appreciate the more what he has had to say.

It is only within the last two and a half years that any serious attempt has been made to establish regular aerial passenger service in the United States. There had been a few efforts prior to that time and there had been numerous individuals and a few companies ready to take passengers on special chartered trips. But there had been no concerted effort to prove the value of aerial transport.

The time has now come when we recognize that passengers, when taken into the air, must be afforded the comforts provided in the modern Pullman car. For that reason we have developed the multiple-motored airplane with tremendous lifting power and speed, and have introduced the big cabin plane providing every luxury.

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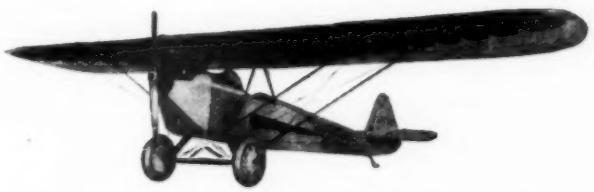

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the ship, when fully loaded, in flight, or carry it higher into the air if necessary. In other words, any two of the highly perfected motors might fail and the big ship will go ahead on an even keel and climb over a nearby mountain if you want it to.

The passenger rides in a heavily upholstered chair giving more comfort than even your Pullman seat. He lounges beside a broad window that affords him an unobstructed view of the scenery that unfolds before him. He may talk comfortably with his neighbor in the adjoining seat. He may stand up and stretch, if he so desires, and he may walk up and down the aisle of the cabin. He may go back to the lavatory and find it as fully equipped as any to be found in a Pullman car. And when noontime comes, the steward will serve an excellent luncheon. The passenger may operate a typewriter, if he so desires, or he may dictate; he can write a letter by long hand with the utmost ease, or he may pass the time away by reading.

This I relate to prove that those in the aviation industry realize that speed alone cannot make the airplane popular. Passengers must be given comfort, a comfort rivalling that to be found upon any other means of transport. That is being done and I am confident that the dawn of the day of real popularity of air travel is with us.

In the past two years we have accomplished much in the way of air transport. In the next few years I predict we will accomplish ten times more. I predict that the entire United States will be spanned by aerial trunk lines, with many connecting feeder lines, and that this development will be brought about within the next two or three years.

Experts have figured that the man or woman who earns $10,000 a year, or more, cannot afford to travel by any other means than by air. The salary figures at a ratio of $33.00 per day; the excess charge for air travel over surface transportation $27.00 per day. There is thus an actual saving in money and it will be conceded that there is also a saving in time.

This differential exists under the schedule of present air travel rates, and these rates admittedly are high. They are justified now because of the expense involved in the operating of airplanes, but in the near future this expense will be reduced and rates consequently will be lowered. This condition will be brought about primarily by the standardization of airplane construction and the resultant lessening of the first cost of

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equipment. It will be furthered by the perfecting of motors that will give greater lifting power and speed with the consumption of less fuel, and it will be still further aided by the increasing number of passengers carried.

As to the matter of fuel consumption let me cite the recent non-stop transcontinental flight of Art Goebel made last fall. He made the journey from Los Angeles to New York City at an average speed of 150 miles an hour—which in itself is remarkable—but more important is the fact that on the trip he used 300 gallons less of gasoline than did Macready and Kelly to make the same journey.

Air Transit Costs

In considering air transportation costs, which now average from 10 to 15 cents per flying mile, it is scarcely possible to make any reasonable comparison with costs of surface transportation because the surrounding conditions are so vitally different. Economically the airplane cannot operate successfully, as regards finances, with a normal load of more than 60 per cent. If that normal is exceeded experience has shown that the peak load surpasses the airplane's capacity requiring the operating of a second airplane, or second section, and at a loss. On the other hand, the railroad can add an extra car or two to accommodate unexpected loads and the added cost is extremely small.

Depreciation Important

In cost, the modern tri-motored, 12-passenger plane just about equals that of the modern Pullman car. In upkeep, the airplane far exceeds that of the locomotive because of its concentrated motive power. The air transport company does not need to buy and maintain expensive rights-of-way, nor is it ordinarily required to maintain elaborate terminals. Most of the airports are municipally owned, and the number of such airports is constantly being increased.

Depreciation of equipment adds heavily to the cost of aerial transport. Leading experts have figured that the airplane is good for about 2,000 flying hours in two years. Either the cost of repairs and upkeep will be prohibitive after that time, or the plane will have become obsolete because of improvements made in construction. In other words, our passenger plane today that costs $80,000 is good for two years—a depreciation of $40,000 annually.

Standardizing Will Help

This element of depreciation is excessive at this time and will be reduced as standardization in construction comes and as improvements are perfected. It must be remembered that until the year 1927 there was practically no construction of commercial aircraft in the United States. Prior to that time all airplanes had been built to meet military requirements. Our air mail lines were established with such equipment and our first passenger lines were inaugurated with military planes so rearranged as to accommodate one or two passengers riding in open cock-pits.

The developments in construction of commercial airplanes that have been made during a little more than a year can be considered as remarkable. The Liberty water-cooled motor was first used nearly exclusively, partially because it was just about the only standard and tried motor on the market and partially because there were hundreds of them left over after the war and they could be purchased cheaply. They have been since replaced, to a great extent, with the Wright, the Pratt & Whitney and other air-cooled motors which give far more power and speed, weight considered, and which cost less for upkeep.

Rapidly the open planes are being replaced with large cabin ships wherein

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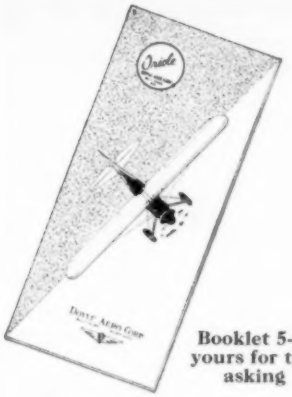

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A Social Error

The future of air travel is enormous. In Europe it is said to be a social error not to travel by airplane. In the United States the day is rapidly approaching when it will be a business error not to take advantage of the speed offered by the airplane. In just a few years everyone will be travelling by air and thousands of hours will be saved to the business day.

Of course we recognize there are certain limits beyond which the airplane as we know it today, cannot go, and beyond which it probably never will go. The airplane, we believe, must of necessity always remain a carrier of limited cargo. By the very nature of the problem involved in aerodynamics, space must be conserved. We can not make a freight car or a box car out of an airplane. We can use it for the transport of mail and for such packages where weight and bulk will reach a certain ratio.

All Letters by Plane

As regards the carrying of mail, I believe the time is near when all first class mail destined for fairly distant points will be carried by airplane. First class mail is comparatively light and takes little space. On the average, forty letters weigh one pound.

With the cooperation of the American Railway Express some progress has been made in the carrying of express packages. Rates were fixed after a series of conferences, these being based on hauls within certain fixed zones and also as regards weight and bulk. For surface transportation the express company accepts packages purely on the weight basis. Obviously such an arrangement is impossible for the airplane where there is such necessity of conserving space.

Air express service has not developed rapidly and its progress has been even more slow since August 1, when the Post Office department made a radical reduction in air mail rates. Previously the charge for air mail had been 10 cents per half-ounce. The August 1 reduction cut this to five cents for the first ounce and 10 cents for each additional ounce, or fraction thereof. The result is that any advantage heretofore existing in air

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express rates has been offset by the low air mail rates.

Before the carrying of express packages by air can become of real importance, there must be a reduction in rates for such service and this reduction can not come, experts say, until the present high cost of airplane operation has been reduced. The time is coming when this result will be brought about. The time is coming, I believe, when many articles that we now classify as freight will be shipped also by air.

I can vision the day when airplanes will be flying with a cruising speed of 200 or more miles per hour and carrying a pay load of 5000 or 10,000 pounds, and when the cost of operating such planes will be 25 or 50 percent less per unit than the existing operating costs of today. Then the carrying of express packages—even freight of a certain sort—will be profitable.

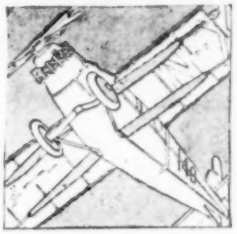
The big airplanes of the future will be able to pick up fruits and vegetables, two or five tons of them at a time—pick them up while they are ripe—and transport them across the continent within twelve hours—and without the necessity of refrigeration.

That is one vision of the future, and it will be realized. One can picture many other developments that will come as the speed and capacity of the airplane are increased. The airplane will never haul sand or gravel; it will never transport heavy pieces of machinery; it will never replace the furniture cars. It will never be economically sound for the airplane to transport articles of great bulk or extreme weight. As I said before, there are limits beyond which the airplane cannot go; but there remain thousands of things the airplane can do.

Civilization Is Transportation

Civilization has progressed as transportation has advanced. Were it possible today to deny the world all means of transportation except that of foot power, chaos and calamity would follow within 24 hours. And I believe that as aviation progresses so will our civilization advance.

In the past we have thought too much of the airplane as an instrument of war. Now we have come to look upon it as a messenger of good will. Historical flights have won many new friends in foreign lands. Transcontinental voyages have brought a new community interest between the cities of the Atlantic seaboard and those of the Pacific coast. Airplanes have made neighborhoods of numerous states and of cities formerly far distant. Conquering of the air is an outstanding achievement of this century toward uniting all peoples, towards bringing about world understanding and world peace, and towards advancing civilization upon this earth.



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CURRENT COMMENT

Harley W. Mitchell

Beacons Should Be Supervised

THE complaint of many pilots about misleading beacons should be taken seriously by the Department of Commerce. There is much to commend in the initiative of private firms which erect and operate beacons for the guidance of flyers and for their own advertisement, but there are also dangers present. One of our flyers, who uses his plane both for business calls and pleasure touring, was recently lost in a storm over Ohio. He had plenty of altitude when his engine chose to miss. Sighting a beacon he made for it, only to discover, fortunately in time, that it was on top of a bank building in the business district of a city. Another beacon was sighted, several miles away. This too, was on a business building, and three miles from the airport. A forced landing was made, with some little damage to the plane, but one man is not so sold on advertising beacons now. The Department can and should make an effort to confine beacons to landing fields and to regulate private lights, so they cannot be mistaken for beacons.

South American Opportunities

The prevalence of South American news in the daily papers is a fair indication that the country is alive to the possibilities of friendly and profitable business relations with this great continent. We are too apt, however, to consider South American trade as peculiarly our own, as far as advantages of geography are concerned. Still, a glance at a world map will show that Rio is no further from London than from New York. By air the distance should work out about the same, with Europe having a shade the better of it. Our advantage in South America will lie in building a demand for American planes and in the advertising which is gained for American planes by their use in the air mail services that are being extended to the principal ports of the West coast.

Dissatisfaction with Air Mail

Most of the dissatisfaction with air mail can be directly traced to the lack of proper facilities for handling in the post offices themselves. Contractors are flying this mail with a schedule performance that runs in the high nineties; mail is promptly and efficiently handled at the field terminals, but once in the post offices themselves, the mail seems to meet with delay. We imagine that before wholesale criticism is leveled at the Post Office that sufficient time ought to be given for the development of an organization to handle the enormous increase of mail. Prior to the decrease in postage to five cents the air mail was being handled with more dispatch each month, but the recent months seem to have shown that the problem is far from being solved.

Mail Contracts as Assets

A recent protest against the award of a mail contract by one of the losing bidders brings forth the observation that it is probably a wise foresight that permits the Department discretionary powers in the award of contracts. It has developed, frequently, that some bidders had little experience and, in some cases, less capital. In fact, one investigation brought out the fact that the capital was forthcoming only in case the mail contract was awarded. This leads one to believe that the chief asset in the minds of the investors, or, rather, prospective investors, was the mail contract itself.

Cautious Money in Aviation

It might be charged that this issue stresses the dangers of incautious investment in aviation stocks a little too much. However, it is a subject on which we feel strongly, and one not to be taken lightly by the public. Both Mr. Hanshue and Mr. Small sound the warnings in their splendid articles in this issue, and we cannot recommend too highly a perusal of both. Aviation enterprises have shown an accretion in values due simply to public interest. To put the matter shortly, any aviation stock was a good buy solely because there were sufficient people who thought so. It will be a little different from now on. Mr. Hanshue calls attention to some of the necessary qualifications that aviation enterprises may have, speaking as an operator with an enviable record. Mr. Small views the matter from the market standpoint; and when both attitudes are viewed together the investor sees a picture that has shadows as well as headlights. The assurance of basic soundness in aviation stocks is at least as important to the aviation industry at large as it is to any individual investor, and it is to the best interests of all concerned to make sure that stocks offered the public in the name of aviation are accurately and honestly described by the organizations sponsoring their issue. We are not trying to tell the public not to invest—far from it; but we do feel that good sense demands careful investigation, and that sound action can only be based on knowledge. Reputable security houses can furnish this information.

XUM

Aerial Navigation for the Novice

By Commander Douglas G. Jeffrey
D.S.O., R.N.F., F.R.G.S.

IV
Position Lines

"It would be the greatest blessing to navigators both young and old, if every other method of ordinary navigation could be swept away."
—Lord Kelvin.

THE outstanding feature of the position line is that a single observation for altitude taken at any time enables the determination of a line on some part of which the ship or plane is situated.

The discovery of the position line would appear to have been entirely accidental. An extract from Capt. T. H. Sumners' book on the subject published in Boston, in 1843, reads as follows: "Having sailed from Charleston, S. C., the 25th of November, 1837, bound for Greenock, a series of heavy gales from the westward promised a quick passage. After passing the Azores, the wind prevailed from the southward, with thick weather; after passing longitude 21 W. no observation was had until near the land; but soundings were had not far, as was supposed, from the edge of the bank. The weather was now more boisterous, and very thick, and the wind still southerly.

"Arriving about midnight, Dec. 17th, within forty miles by dead reckoning of Tuskar Light the wind hauled S. E. (true) making the Irish Coast a lee shore. The ship was then kept close to the wind, and several tacks made to preserve her position as nearly as possible until daylight, when nothing being in sight, she was kept on E. N. E. under short sail with heavy gales. At about 10.00 A. M. the altitude of the sun was observed, and chronometer time noted; but having run so far without any observation, it was evident that the latitude according to dead reckoning was liable to error, and could not be entirely relied upon.

"However, the longitude by chronometer was determined, using uncertain D. R. latitude, and the ship's position fixed in accordance. A second latitude was then assured 10 to North of the last, and working with this latitude a second position of the ship was obtained; and again a third position with a third latitude still 10 further North.

"On pricking off these three positions on the chart, it was discovered that the three points were all disposed on a straight line lying E. N. E. and W. S. W., and that when this line was produced in the first named direction, it also passed through the Small's light. The conclusion arrived at was that the observed altitude must have happened at all points at the Small's light, and at the ship at the same instant of time.

"The deduction followed, that although the absolute position of the ship was doubtful, yet the true bearing of the Small's light was certain, provided the chronometer was correct; the ship was therefore kept on her course, E. N. E., and in less than an hour the Small's light was made bearing E. by N. ½ N. and close aboard. The latitude by D. R. turned out to be 8 in error." The above is the first recorded use of the principles which today govern celestial observations for directing position at sea and in the air.

Favorable Observation Time

The last article of this series dealt very fully with the determination of latitude and demonstrated that latitude by itself was only a line of position and not a "fix." It was also pointed out that the most favorable time for observation for latitude was when the body observed was on the Meridian, that is bearing due North or South. Similarly the most favorable condition for observations for longitude is when a celestial body is on the Prime Vertical, that is bearing due East or West. As in the case of observations taken for latitude, when the subject is on the Meridian, an exact knowledge of the latitude is not essential to the determination of correct longitude. In fact under the above conditions, an error in latitude of 40′ will not materially affect the result. Bear this in mind; on the Meridian (bearing N. or S.) for latitude, and on the Prime Vertical (bearing E. or W.) for longitude, are the ideal conditions.

These two facts and especially the latter are invaluable to the navigator: because it means just this—that given an object on the Prime Vertical, the correct longitude can be obtained using an approximate latitude and that with the time thus obtained, a correct ex-Meridian observation for latitude can frequently be secured.

The further the object observed (for latitude) is from the Meridian, the more vital correct time becomes; and the further the object observed (for longitude) is from the Prime Vertical the more important the correct latitude becomes.

To make this even clearer: parallels of latitude circle the globe in an east and west direction, and to get the best results, we select objects, bearing at right angles to these parallels, namely, North or South Meridians which run from Pole to Pole; and similarly we select objects bearing at right angles to that direction, viz.: East or West.

A celestial body can of course only bear true East or true West when its declination and latitude are of the same name, for example: when the observer is in North latitude, and the object has northerly declination, conversely when the latitude and the declination are of different names, the body cannot bear East or West; and the moment when it approaches nearest to these bearings will be when it is rising or setting.

Refraction is frequently at a maximum under these conditions, and even if this is not the case, observations at very low altitude are usually unsatisfactory.

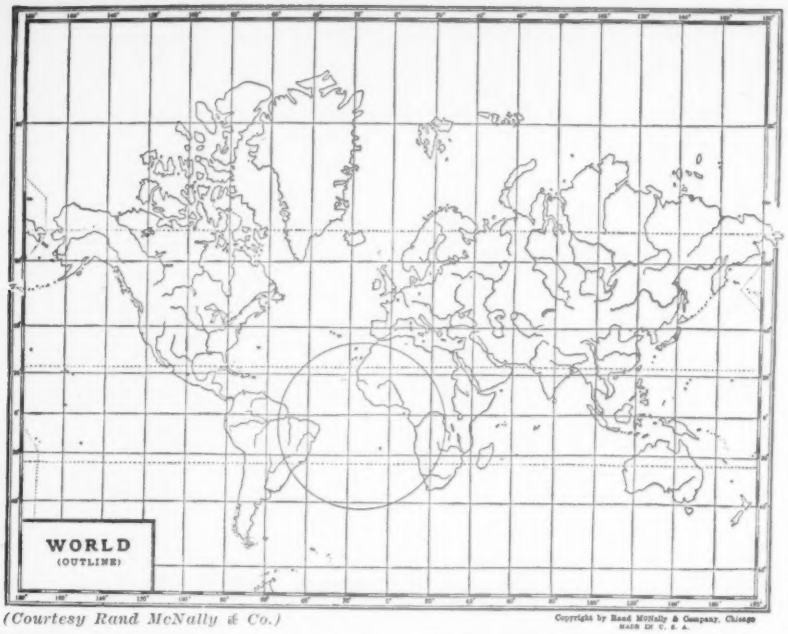
In our northern latitudes, during the winter months at least, "longitude by sun" may prove difficult and unreliable. So we fall back on the friendly stars—ever the surest guide of the navigator (and never more so than today), one of which we can always find on the Prime Vertical, or Meridian.

Advice to Beginners

Lecky's advice to beginners in star work, though intended for Mariners, is equally applicable to Airmen:

"Advice to Beginners: Do not despair because your first efforts are not attended with particularly good results. Persevere; 'Rome was not built in a day.' Practice in fine weather, so as to gain confidence, and to feel perfectly at home with the work in case of requiring its aid in bad weather, or in an emergency. If you do this you will soon get out of conceit with the sun."

What is usually referred to as a posi-



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Circle of position G. A. T. 1″ 0′ 0″ declination 5° south. Altitude 50°.

tion line, is in reality a circle of position.

Forgetting heavenly bodies for a minute, let us take the famous Indianapolis Sailor's and Soldier's Monument. I can see it as I write; I mean the old Memorial, not the much discussed World Memorial.

We have the Soldier's and Sailor's Monument, and a sextant; we take an angular altitude from the top to the plinth—suppose this angle to be 53° 29′. We should know by a simple trigonometrical calculation that we are 100 yards from the Monument. And at any position 100 yards distant from the Monument, we should get the same altitude, whether we stood just outside the Columbia Club, English's Hotel, or the Circle Theatre. That is: our calculation, based on an angular altitude, would only prove that we were on a circle, the circumference of which was at all points 100 yards from the Monument. This is a circle of equal altitude. If the angle be greater than 53° 29′, we shall be in the circle. If less, outside it.

The height of the Memorial from the top to plinth is 284 feet. The reader can check this by the old Sailor's wrinkle of multiplying the height in feet by .565 (a constant factor), and dividing it by the angular altitude expressed in minutes. This gives the distance in nautical miles (2,000) yards and decimals of a mile. Try it out.

At any moment the sun is vertical to some portion of the earth's surface, and at this spot, the true altitude of the sun is 90°, right overhead, and the position of the observer will correspond with the position of the sun in the heavens. The sun's time or the apparent time at Greenwich; sun's hour angle, or Meridian distance (they are the same) corresponding to the longitude, and the sun's declination to the latitude of the observer.

To find the spot on the chart or map where the sun is vertical at a given time is comparatively simple. The apparent time at Greenwich converted into degrees and minutes of arc is laid off as a longitude and the declination of the sun for a latitude.

Let us assume a position in longitude 15 West and latitude 5.0 South and assuming that an observer at 1 0 0 G. A. T. obtains a true altitude of 50-00. Subtract this altitude from 90 degrees. The altitude of the sun at any spot, where it is vertically overhead; this gives us the distance, of the sun from the zenith of the observer, namely 40 degrees. Take this distance on dividers, and using latitude 5° 0′ S. and longitude 15 degrees West as the center, describing a circle. This is a circle of equal altitudes, and the observer is somewhat on that circle.

The circles shown are really circles, whereas if they were drawn correctly, they would assume an elliptical form. The Mercator's projection used in the figures gives them a longer axis, in the north and south direction.

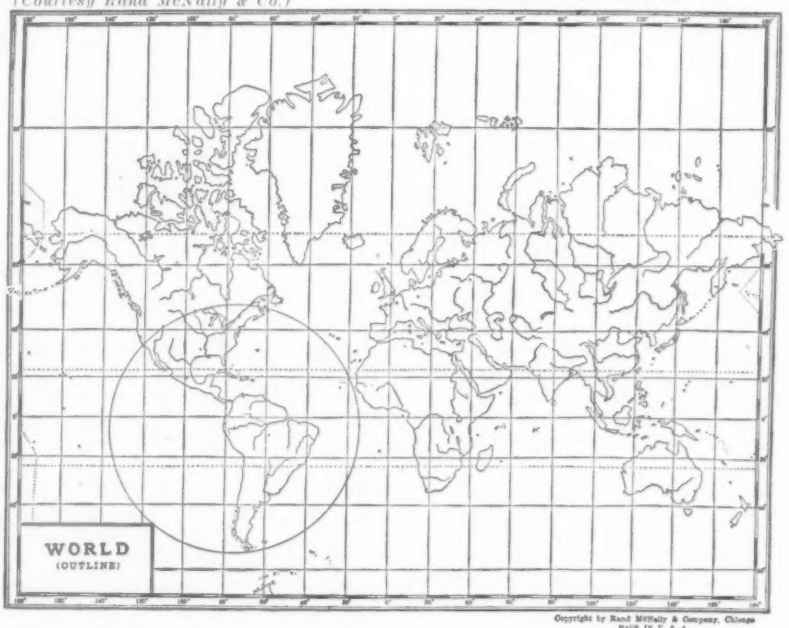
This degree of accuracy is not necessary in this case as we are merely demonstrating a principle. In fact the operation of drawing circles as described above is quite unsuited to the needs of the navigator and hence is never performed.

When the sun is nearly vertical to the observer the circle of position will be small and the greater the distance of the observer from the sun the larger the circle and the larger the circle the greater the portion of its circumference that may be treated as a straight line without error.

In practice the navigator knows his latitude say within half a degree and the drawing of a complete circle is unnecessary. All that is required is an arc of the circle sufficient to cover possible

Circle of position, G. A. T. 5″ 0′ 0″ dec. 5° 0′. Alt. 33° 0′.

(Courtesy Rand McNally & Co.)



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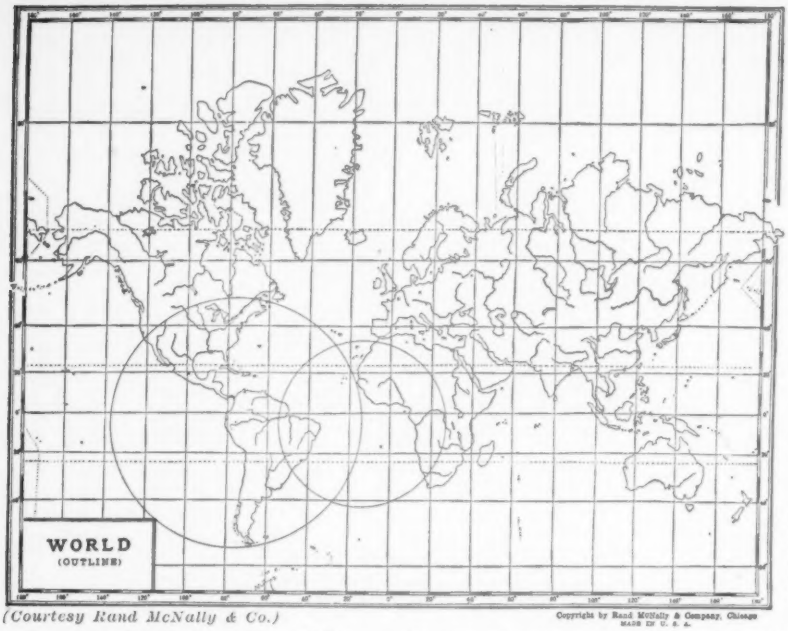


(Courtesy Rand McNally & Co.)

Two circles of position. The smaller circle is G. A. T. 1" 0' 0" dec. 5° 0'. South altitude 50° 0'. Larger circle is G. A. T. 5" 0' 0" dec. 5° 0'. South altitude 33° 0'.

errors in dead reckoning latitude and this are, if the circle is big enough, can be treated as a straight line.

To obtain this line if the latitude is in doubt calculate a position using a latitude say 15'—20' less than D. R. latitude and again with a latitude 15'—20' in excess of D. R. latitude. The resulting positions are recorded on the chart and connected by a straight line. This line is an arc of a circle of equal altitude, a line of position or a Sumner Line, and the observer is somewhere on this line; unless the error in latitude is greater than that allowed.

Any portion of the circumference of this circle considered as a position line will always be found to be at right angles to the sun's bearing and vice versa. Given one we can always find the other.

This explains the fact that noon is the best time to observe for latitude, the sun then bearing North or South and any part of the circle of position (when considered) as a straight line, will be at right angles to those bearings, and will run East and West. The same holds true with regard to longitude—when on the Prime Vertical the celestial body will bear due East or West and the Line of Position will run North and South.

A third and very important factor in the Sumner Line problem is the fact that the line can be extended until it meets some well known point and although allowing that the distance from the point will not be known the direction will, and the line of position becomes a line of bearings. The value of this in long cross country flights and overseas flights when making a landfall is obvious.

If the line passes wide of the goal, rule a line parallel to the first position through the desired point and then shape a course to get on to the course-bearing line as quickly as possible.

This is a wonderful age and the navigator now performs the somewhat lengthy calculations described above by the "inspection" of tables and the use of navigational contrivances that solve the problems mechanically.

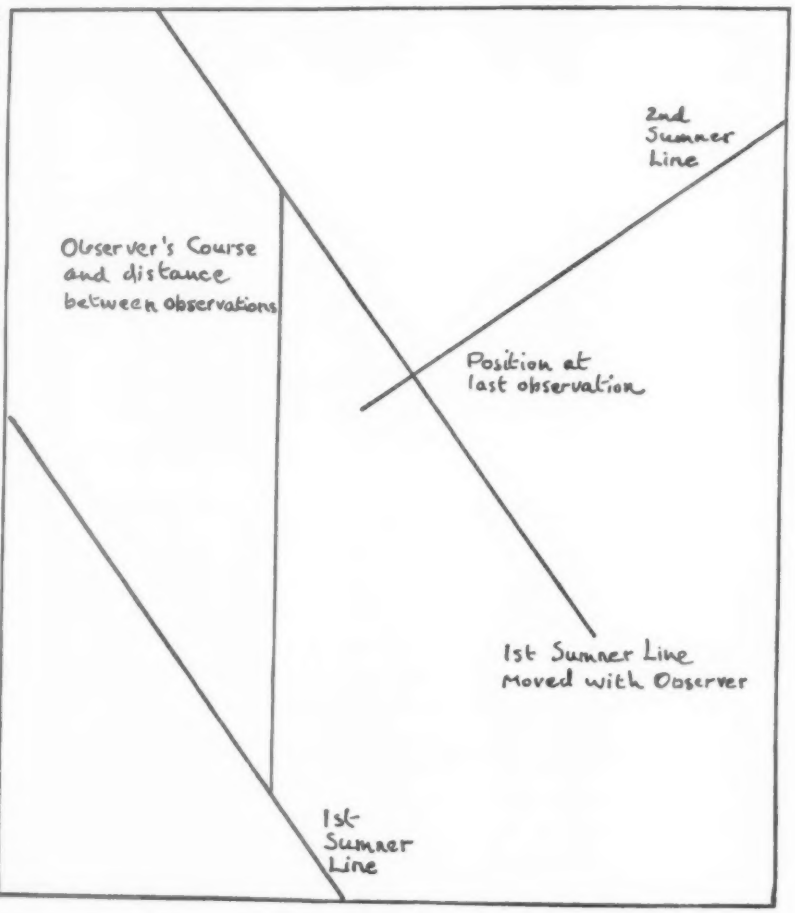
Understand What and Why

The development and improvement of both tables and instruments is of vital importance to Aerial Navigator and to work with the necessary speed and accuracy he must be conversant with and use both tables and instruments to the fullest possible extent; but he should also understand *what* he is doing and *why*.

It is astonishing the number of navigators and in this I include a goodly number of my marine colleagues who use logarithms daily without any idea of the processes underlying the calculations and whose only grasp of the situation is that certain formulae produce certain results.

Air Navigation is in its infancy and we must look to the Department of Commerce to insure that the future navigator of commercial aircraft be required to

(Continued on page 86)


2nd Sumner Line
Observer's Course and distance between observations
Position at last observation
1st Sumner Line Moved with Observer
1st Sumner Line

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Flight Training the Navy

By K. M. Painter

THESE are full days for the Naval aviation training station at Pensacola, Florida. From eight in the morning until three-thirty in the afternoon airplanes fill the air like fledgling-birds in the Spring. Here is a group flying in formation, while thousands of feet above them is a lone plane rolling and looping. Landplanes, seaplanes, observation planes, and the speedy little Hawks of the combat squadron—altogether more than a hundred and fifty planes flying simultaneously. All piloted in the hope that the coveted Naval Aviator's designation will be forthcoming. It is hard to realize that the Navy has been in the air but eighteen years, and during the first eight developed less than a hundred pilots. It might be well, before looking in on the present organized system of aviation training, to briefly trace the airplane's Naval career.

The First Naval Aircraft

The Navy Department took official cognizance of aviation in January, 1911, when Captain W. I. Chambers was given duty in connection with the study of aviation in the Navy Department. In the Spring of the same year contracts were let for three heavier-than-air craft, the Wright brothers being awarded a contract for one land plane and the Curtiss Airplane Co. being awarded a contract for two Curtiss planes—one a land plane, the other a seaplane with land gear that could be substituted for the pontoon. Each contract stipulated that a Naval officer should be taught by the contractor to fly each plane, and Lieutenants Ellyson, Rodgers, and Towers were the first to qualify as aviators under the rules of the Aero Club of America.

After various experimental air stations had been found unsatisfactory, mainly because of climate, a board was appointed by the Navy Department and decided upon reopening the navy yard at Pensacola for this purpose. The equipment of the aviation school, when it was opened in 1914, consisted of four Curtiss flying boats, two Curtiss pontoon-type planes, two Wright pontoon planes, and one Burgess flying boat. In lieu of steel hangars, tents were ingeniously designed to accommodate the nine planes. The training syllabus depended entirely on the ideas of the officers in charge of training, and not until 1915 was the first real class in aviation started, made up of ten Naval and Marine officers. During this period appropriations for Naval aviation were very small. It was often necessary for officers engaged in flying to pay out of their own pockets for gasoline, oil, and spare parts, if they desired to continue flying.

In the summer of 1916 Congress made the first separate appropriation for Naval aviation which amounted to $1,000,000. Anticipation of trouble with the countries at war necessitated the expansion of Naval aviation, and in the latter part of 1916 a number of Naval Militia officers from various States were given aviation instruction. To further swell the flying ranks, certain enlisted men at the air station were detailed for instruction, with the result that when we entered the war in April, 1917, there were almost 100 qualified pilots and students.

During the war our fleet, as well as Naval aviation, was split up into so many widely separated activities that the forces as a whole lacked coordination. Naval aviation had never operated with the fleet, the place where it obviously belongs, and the first step in reconstruction was to assign certain specialties for operations and development. Accordingly, the mission of the Atlantic Fleet Air Force, now designated as the Aircraft Squadron Scouting Fleet, became the development of torpedo planes and seaplane scouting; the mission of the Pacific Fleet Air Squadrons, now designated as the Aircraft Squadrons Battle Fleet, became the development of spotting, combat, and airplane scouting. Until this reallocation, only primary training in land and seaplanes had been given at Pensacola, but the new system called for specialization. So it came about in 1923 that the Naval air station at Pensacola undertook the training of officers in the various branches of Naval aviation, and five separate training squadrons were organized.

Storming Pensacola

Aviation enthusiasm was on the upward trend. More and more officers chose the training course when they had completed their instruction at Annapolis. Pensacola was stormed by would-be aviators. This increase of air-mindedness led, in 1926, to a pre-training or indoctrination course from which only the best material was selected for the full Pensa-

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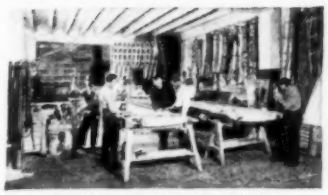

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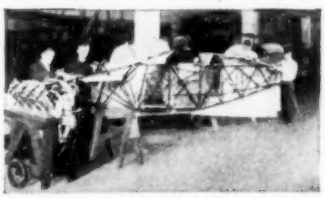

Factory engineer explaining to student construction of engine carrying frame.

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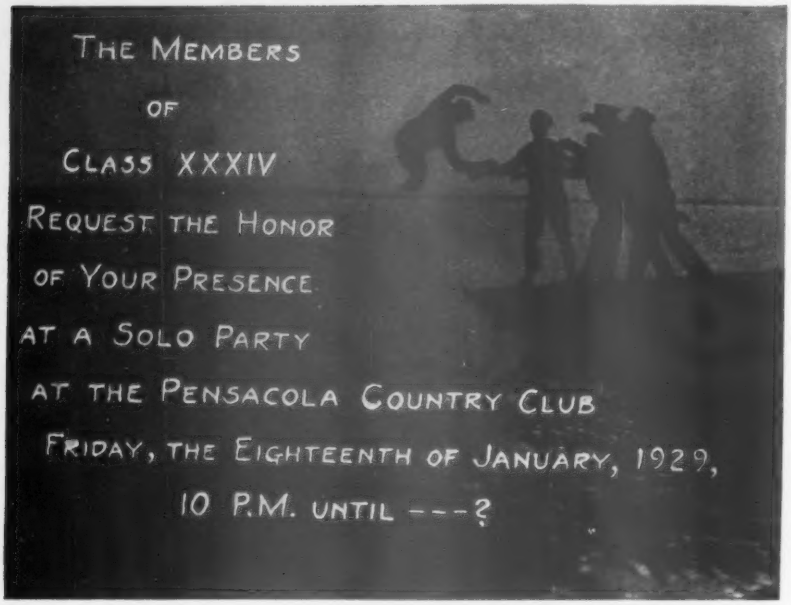

This invitation is also suggestive of the type of solo party commonly held in the daytime.

cola training. While, whenever practicable, every member of the graduating class of the Naval Academy is given a five-weeks' flight-training period at Annapolis, to develop his air sense, only those who choose to specialize in this branch of the service are given further training. The preliminary or air-sense training is given before the officer leaves on the two-year cruise that must follow his graduation. At the end of the cruise, he may decide to go into the aviation service and a certain per cent of each graduating class do. If this is the case, he is sent to San Diego, California, or Hampton Roads, Virginia, for the elimination course of five weeks. This course gives him fifteen to eighteen hours of dual instruction and if he is among the lucky 60 per cent who pass, he comes to the mecca of aviators—Pensacola, Florida.

Starting All Over

Although he has had sufficient training to solo, he starts over again at Pensacola. The NY-2 seaplanes are his first ships—he personifies them as Amaimon. He stands in awe of the twenty-five squadron instructors, and lives and talks aviation. He is a member of a big class—recently enlarged from forty to fifty—and though he thinks individually, his reactions are seldom unique. Any instructor will say that as a class all student-aviators fly alike. Every month a new class starts, but thirty per cent of the aspirants for "wings" are dropped in squadron one. When Commander C. P. Mason, Superintendent of Flight Training, was asked why so many students failed to pass the courses, he had a ready answer. "We believe that everybody we start should fly. We turn pilots out as a factory would produce its product. They have all been submitted to a rigid flight-physical examination, and there is no reason for failures. We put them down to lack of proper application." In this connection, it is interesting to note that there are twenty per cent more failures among the enlisted personnel than among the officers.

But the training at Pensacola is not confined to actual flying. Each day is divided into two equal "watches." Half of the students fly the morning watch and attend ground school in the afternoon; the other half reverse these periods. This plan assures the greatest efficiency, for all facilities are in use both shifts every day. At ground school the student is instructed in aerial navigation, aerology, aircraft machine guns, and the various types of airplane engines. In the past the ground school course has taken 31 weeks, carrying the student through the first three squadrons, but the new training syllabus cuts this period down to 21 weeks. In conjunction with the ground-school course, there is a trap-shooting range, to improve marksmanship. Although the range has all the attractions of a purely-pleasurable sport, the student must make at least fifty hits out of a possible 125 to pass this phase.

The Largest Squadron

Squadron One, or, to give it its official title, Squadron VN 1-D8, is the largest of all training squadrons. Its fifty-two planes are sheltered in four hangars, adjacent to the beach. A watch tower and a large steam crane distinguish Squadron One; they are unique to Squadron One. The great number of planes at this squadron makes the crane necessary. The usual method of placing trucks under the planes in the water and pulling them up a runway with a tractor would require too much time.

Although the air station has an observation tower in which men are stationed to watch over each quarter of the compass and keep track of all planes in the air, Squadron One has its own watch tower. In the early days a speed boat used to follow the student who was making his first flight alone, and a surprising number of those who attempted solo came back in the boat, wetter but wiser men. Those crude days have long since passed and now even minor crashes occur very infrequently, but there still remains enough uncertainty about the first solo to keep the tower watch alert. It undoubtedly inspires the pilot with more confidence if he knows that someone is watching him.

But before a Navy fledgling solos, he is allowed fifteen hours of dual instruction—the Gosport helmet providing the means of communication between instructor and student. At the end of his instruction period, the student is given a check hop. Borrowing from the Romans, the instructor gives his decision by an "up" or a "down." If he says "down," the student is entitled to additional instruction up to a total of eighteen hours. If he gets another "down," he is checked by another instructor, and if this decision is also "down," he packs his fondest hopes in his kit and sticks to the water. If, however, he gets an "up" on the second check, he must have a third check by another instructor. An original "up" entitles the student to solo. An original "down" means that two "ups" must be forthcoming if he is to continue the course.

"Solo" Parties

And so it follows that every so often a group of khaki-clad officers gather at the runway in front of Squadron One and with all the dignity possible, heave a comrade into the waters of Pensacola Bay. The wet and dripping officer wades ashore smilingly. There is a round of cheering and the group pounces on another victim. This ducking celebrates an epochal event. It is in honor of the first solo flight. After every member of a group has soloed, the class has a big "whoopee" or solo party. The commanding officer of the training station—now Admiral J. J. Raby—lends dignity to the party which, from long-standing custom, is held at the Pensacola Country Club.

So far the student has at least fifteen hours in the air at Pensacola. To him they are the most eventful of his career, but after his celebration he finds out

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The beach front at Pensacola, showing the seaplane squadrons I and III.

that he knows little about flying. He takes the seaplane out for five hours, and then is given another instruction hop. Every five hours he is given further instruction. When he finishes the course in primary type seaplanes, he has 60 flying hours to his credit. He learns to maneuver these slow, heavy planes, does a passable barrel-roll and tailspin, and thinks that his flight training from then on will be a snap. He revises his opinion in the next squadron, for the courses follow like a thrilling serial, each installment, or squadron, being more and more difficult.

The Boat-Shot

Before a student is "promoted" to Squadron Two he must make a boat-shot. A boat-shot differs from a precision-landing in that the latter maneuver is made with the throttle, if necessary, while a boat-shot must be made from an altitude of 3,000 feet, with the engine off. To successfully pass this check the student must land within 200 feet of a boat that is anchored in view of the squadron's watch tower. An incorrectly calculated boat-shot frequently comes to disaster.

Not long ago a student who had had considerable difficulty in passing the first phases of the course took off for this maneuver. The boat-shot was announced in the squadron office and the instructors and commanding officer gathered in the tower to watch. The plane approached the boat with so much altitude that, to keep from over-shooting, it was necessary to side-slip. This the student attempted to do, but he pulled the nose up too high and lost his flying speed about fifty feet up; inevitably the plane dropped in the water on its wing. All the instructors could see, long before the crash, that the plane was going in—and any one of them could have avoided it by a forward push on the stick. While this incident is not noteworthy in itself, it serves to illustrate the fact that though a student has flown 60 hours—most of which has been solo time devoted to practicing landings—he is not immune to a purely elementary error which would have been avoided had he mastered the first fundamental of flight. The purpose of the boat-shot was served, the student was shown in his true light, and dropped from the course.

Seventy per cent of the original class are left to enter Squadron Two where they begin the primary work in NY-1 landplanes.

An Echo of the Italia

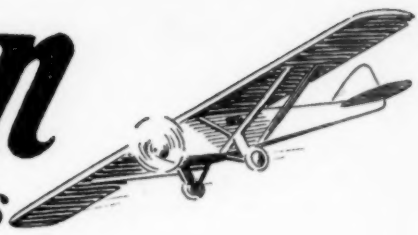
(*Continued from page* 36)

sponsibility it is to state exactly what did occur.

Mr. Parijanine's book is not, like the account written by Davide Giudici, the story of a member of the relief expedition and of one who saw with his own eyes the rescue of Zappi and Mariano. In this respect it is, of course, open to the objection that it is not testimony but merely more or less well-established hearsay. Mr. Parijanine has, however, assembled his material with an entire recognition of the limitations of his own qualifications, and as a result the book stands very frankly as an accumulation and presentation of evidence rather than as a personal narrative in any sense. The effect of the book is to carry very sure conviction to the reader that the events it deals with are in need of a much more searching investigation than any they have yet received.

The book tells the story of the rescue of the Italia survivors from the point of view of the crew of the Krassin. These men were mostly Communists, recruited in the U. S. S. R. They do not appear to have felt that they had any axe to grind, and were sincerely interested in the success of their expedition from humanitarian motives. There is no reason to believe that they were prejudiced against any of the men they rescued. The observations made by different members of the crew are thus almost entirely objective. Mr. Parijanine reports that a very general feeling of suspicion concerning the behavior of Zappi prevailed among the crew of the ice-breaker, and the reasons for this suspicion are plainly described. The author has made the attempt to prepare what he calls "a court record" of the whole matter, and his story is very nearly that. It is a deeply stirring book, and unless the truth regarding the disappearance of Malmgren is judged of no importance it is valuable as an effort to provoke those who know the truth to tell it.

Jack Stinson



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Simple Aerodynamics

By Alexander Klemin
Daniel Guggenheim School of Aeronautics, New York University

Elements of Airplane Mechanics

Gliding

A knowledge of airplane mechanics is a necessary foundation for both pilots and aeronautical engineers. In the following article we shall deal with only a few of the simplest but most essential problems.

IN Fig. 1 is shown an outline of an airplane on a glide. With power shut off, it is subjected to only three forces, lift, drag and gravity. If there is to be a steady glide at a constant speed, then these three forces must balance one another or be in equilibrium, as the mathematicians say. Suppose that the glide path makes an angle with the horizontal. The relative wind is along the glide path and of opposite direction to the motion. Then the lift must be perpendicular to the glide path, the drag must act along the glide path; and gravity acts vertically downwards.

By the principles of mechanics stated in the first article, we can resolve the force of gravity W along and perpendicular to the glide path as shown in the diagram.

The force along the glide path will be $W \sin\ominus$, and this must evidently balance the drag. Hence we get the equation

$$W \sin\ominus = D_t = (K_x + K_p)AV^2$$

by the previous article.

The force perpendicular to the glide path will be $W \cos \ominus$, and this must evidently balance the lift. Hence we get the equation

$$W \cos\ominus = L = K_y AV^2.$$

Dividing these equations one by the other, we get

$$\frac{W \sin\ominus}{W \cos\ominus} = \tan\ominus = \frac{D_t}{L} = \frac{(K_x + K_p)AV^2}{K_y}$$

$$= \frac{K_x + K_p}{K_y}$$

It follows from this that the greater the L/D_t or efficiency ratio of a plane, the flatter will be the angle of glide.

A flat angle of glide is an advantage from the point of view of a pilot seeking an emergency landing, since it gives him a longer gliding range.

Pilots in reporting on the behavior of some machines state that they "float" when approaching the ground, and that a landing is made difficult thereby. No very plausible explanation of floating has been offered hitherto. A possible explanation is that with a wing fairly close to the ground, ground interference makes itself felt in two ways: increase in lift coefficient, and increase in lift over drag. If the plane is efficient to begin with, the floating tendency is readily understood. The author believes that a remedy is always available to the pilot by simply bringing the plane in at a greater angle of incidence, giving a poorer lift over drag ratio.

It should be noted that the angle of glide is dependent solely on the lift over drag ratio of the plane and not on the wing loading. If the glide angles of two exactly similar planes, one of which is more heavily loaded than the other, are compared, they will be found to be exactly the same. The only difference will be that the heavily loaded plane will glide faster than the lightly loaded one.

Since the angle of glide depends on the lift/drag ratio, it follows that a glide can be made at any desired angle to the horizontal between 90 degrees and the angle of flattest glide. Further, for each angle of incidence of the wing, there will be a corresponding lift/drag and hence a corresponding angle of glide.

Example

In the plane considered in the previous article, the monoplane wing area was 200 square feet, the wing section was a Clark Y, the gross weight was 1600 pounds, and the parasite resistance coefficient was .0000325 referred to the wing area.

If the wing is at 6 degrees incidence to the flight path, what will be

(a) the angle of the glide path with the horizontal?
(b) the speed on the glide?
(c) the radius of glide from an altitude of 5000 feet?

(a) At 6 degrees incidence, the K_x of the wing is .000132 (see Table in Article 6) and the K_y is .00214.

Therefore

$$L/D_t = \frac{K_y}{K_x + K_p} = \frac{.00214}{.000132 \quad .0000325}$$

$$= \frac{.00214}{.0001645} = 13 \text{ (approximately)}.$$

Hence $\frac{D_t}{L} = \frac{1}{13} = \tan\ominus$ (where $\ominus$ is the angle of glide) = .077. Looking up the angle corresponding to this tangent in a table of trigonometric functions, we find it to be 4°24′ or 4 degrees and 24 minutes.

(b) To find the speed on the glide we use the equation

$$W \cos\ominus = K_y AV^2.$$

In this case $\cos\ominus = .9970$ (approximately) so that $1600 \times .9970 = .00214 \times 200 \times V^2$

and $V^2 = \frac{1600 \times .9970}{.00214 \times 200} = 3720$ and $V = 61$ miles per hour.

(c) From Fig. 2 we see that

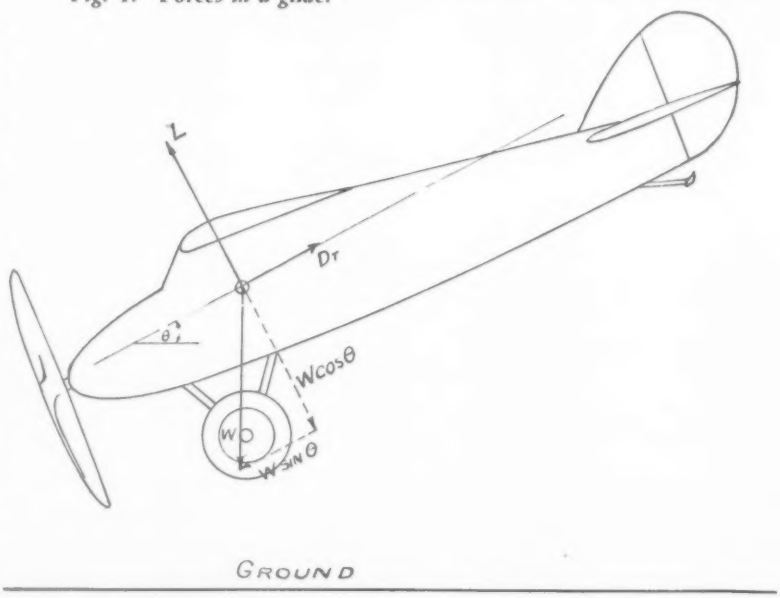
$$\tan\ominus = \frac{\text{altitude}}{\text{radius of glide}}$$

In this case therefore $.077 = \frac{5000}{\text{radius of glide}}$

and the radius of glide is 6500 feet.

We selected for our calculations a particularly well streamlined machine. Normally

Fig. 1. Forces in a glide.



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the glide path will be much steeper. A best glide of one in twelve may be considered quite good.

In Fig. 3, from calculations similar to those just made, we have plotted a curve of angles of glide against the incidence of the wing and the speed in miles per hour.

From this curve we see that the best angle of glide of 4°15′ occurs at 3° angle of incidence.

The angle of glide increases on either side of this point.

It appears therefore that the pilot can make a glide of the same steepness at two different angles of incidence and two different speeds along the path.

Gliding Into a Small Field

When making an emergency landing into a small field, particularly when the field is surrounded by obstacles such as trees or telegraph wires, the question arises as to the best way of landing. There are some methods such as coming down in a tight spiral, side slipping, fish tailing (i.e., swinging the tail of the plane from side to side) which in the hands of a skilled pilot are perfectly safe and very effective in losing altitude in a small horizontal distance of travel. Such methods however are evidently not suitable in passenger carrying work.

If the pilot does not wish to adopt the above mentioned methods, he can glide down at high speed and on a very steep path, and flatten out quickly just before reaching the ground. There are two difficulties here. First, real judgment has to be exercised in flattening out at just the right instant. Second, if the pilot does flatten out at the right instant, his plane will still have a high rate of speed. If he flattens out to a high angle of incidence, and a large coefficient of lift, the plane may "zoom," that is climb rapidly into the air for a second or two and then drop rather suddenly and uncomfortably. Evidently zooming and then dropping will not be pleasant. If, on the other hand, the plane is flattened out to a relatively small angle of incidence, the landing speed will be high and while there will be no tendency to zoom, the plane will run for a long distance on the ground, which is still a serious difficulty in a small field.

It may be that in modern practice, pilots will be able to adopt another method of procedure, namely the "stalled" glide, that is a steep glide at a high angle of incidence, with the nose of the plane above the horizon.

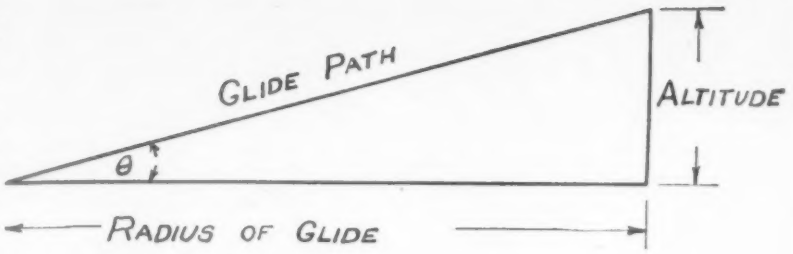


Fig. 2. The tangent equal to altitude/radius of glide.

For example in the hypothetical plane we are dealing with, suppose the pilot elects to glide in at 16 degrees angle of incidence.

$$\text{the } L/D_t = \frac{.00300}{.000431 + .0000325}$$

$$= \frac{.00300}{.0004635} = 6.5$$

The glide is therefore just twice as steep as in the flattest glide, and the angle with the horizontal is given by

$$\tan\ominus = \frac{1}{6.5} = .154 \text{ and } \ominus = 8°45'$$

Since the wing is at 16 degrees to the glide path, it will be 16′—8°45′=7°15′ above the horizon.

There is therefore little risk of nosing into the ground or of nosing over, and the pilot can easily set his ship down in a three point landing (that is, with the front wheels and tail skid touching the ground simultaneously).

When flattening out from a flat glide at a small angle of incidence, the lift coefficient is increased so much that all the vertical velocity of the plane is killed. A well executed three point landing can be perfectly gentle, without the semblance of a shock.

Since the stalled glide is made at a high lift coefficient, it is impossible to kill the vertical speed entirely by going to the maximum lift-coefficient. It is interesting to see what this vertical speed is.

From the formula

$$W \cos\ominus = Ky\, AV^2$$

$$W \cos 8°45' = 1600 \times .9883 = .003 \times 200 \times V^2$$

$$V^2 = 2630$$

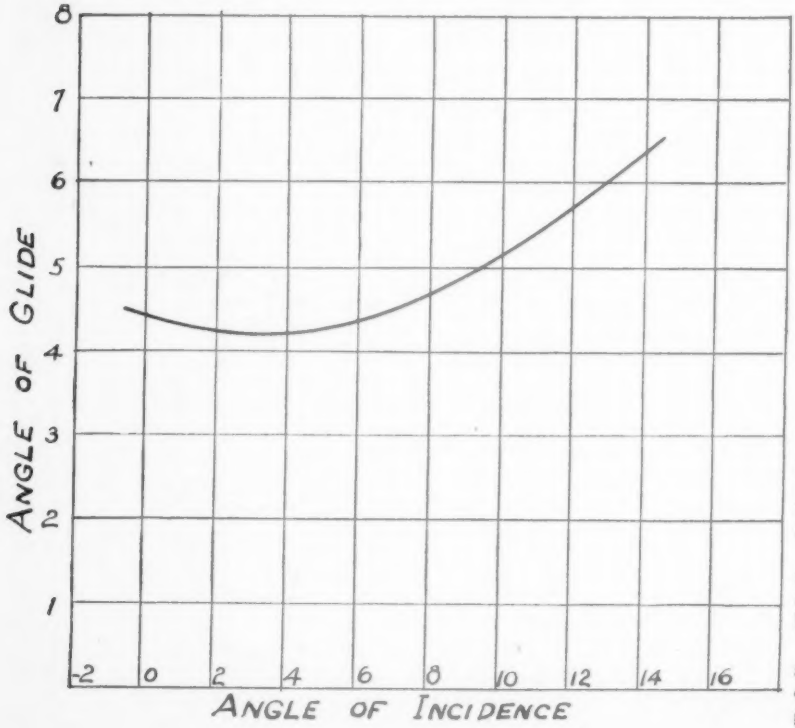
and V = 51.3 miles per hour.

From Fig. 4 we see that the vertical velocity of the plane on the glide path is $V \sin\ominus$. In this case $\sin\ominus = .1521$ and the vertical velocity is $51.3 \times .1521 = 7.80$ miles per hour.

A landing with such vertical velocity might seriously damage the landing gear, or the fuselage at the points where the landing gear attaches.

Stalled glides to the ground have been achieved in many machines without serious damage. Nevertheless if a stalled glide is to become a common method of

Fig. 3. Curve showing angles of glide plotted against incidence of the wing and speed in m.p.h.



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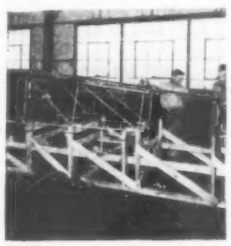

Student working on the fuselage of a plane. In this department students are taught how to build every part of many makes of planes

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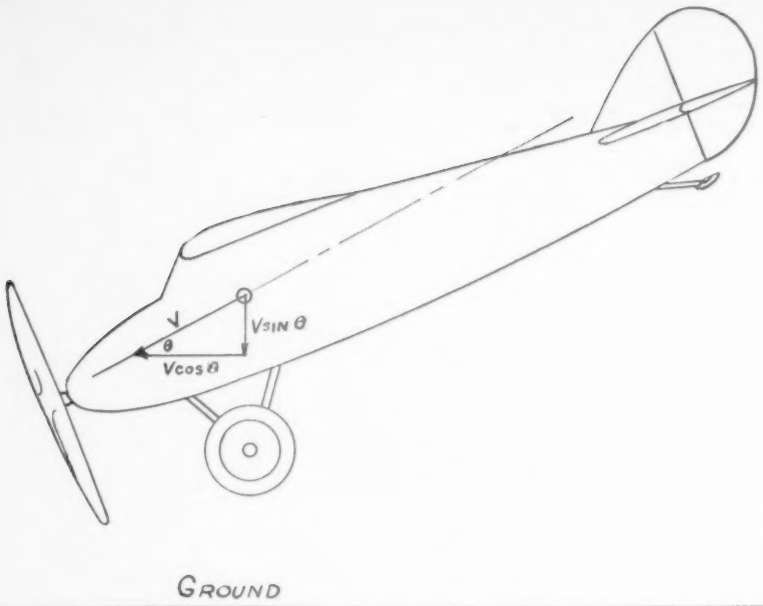


Fig. 4. Velocity in a glide.

getting into a small field, airplane designers will have to provide more shock absorber travel to take up the vertical velocity.

Lateral control at the stall will also have to be improved. This we shall have occasion to discuss in a later article.

Vertical Nose Dive

It might be thought at first blush that if a plane is put into a vertical nose dive as shown in Fig. 5, with no lift at all on the wings, the downward speed would become tremendously high. When the machine is first put into a nose dive, the acceleration is indeed very high, but with increase of speed the drag of the wings and the parasite resistance increase also till they balance the entire weight of the airplane. Then there is no further downward acceleration and the plane comes down steadily at its terminal velocity.

Referring again to our hypothetical plane, the lift of the wing will be zero at a negative angle a little beyond —4 degrees, and the K_x of the wing is then .00004.

In the vertical nose dive, since gross weight now equals drag, we can write

$$W = (K_x + K_p)\, AV^2$$

$$1600 = (.00004 \quad .0000325)\ 200\ V^2$$

and $V = 332$ miles per hour.

Of course we are working with a particularly clean machine. The diving speed would be much less for the ordinary plane.

We can rewrite the above formula in a more convenient form

$$V^2 = \frac{W}{A\ (K_x + K_p)}$$

From this formula we see that the terminal velocity will

(a) increase with the loading per square foot.

(b) increase as the drag of the wing at no lift diminishes.

(c) increase as the parasite drag coefficient diminishes.

There is a record of the maximum diving speed ever attained. We should imagine that for a racing plane capable of 300 miles top speed, the terminal diving speed would be well over 400 miles per hour.

The action of the propeller in a nose dive is rather curious. In the first stages of the dive the propeller thrust evidently increases the acceleration. But later when the speed goes well above the maximum speed of the plane, the propeller blade elements will be working at negative angles and the propeller will be actually working as a brake rather than as a thrust producing element.

The reader may ask whether the vertical nose dive is dangerous. When the wings are at zero lift, the whole weight of the plane has to be supported by the drag truss of the wing; which must be strong enough to meet the load. Further at zero lift, there is a twisting moment or couple on the wings, which brings a large downward force on the front spar and a large upward force on the rear spar. The wing must be designed to resist this twisting or torsion of the wings. The elevator must supply an adequate counter balancing couple or else the machine will go over on its back, and it must be powerful enough to get the machine out of the dive whenever the pilot wants to. Naturally the vertical nose dive must not be practiced too near the ground. The greatest danger arises however when the pilot pulls out of the dive too sharply. The wing may then go from a low lift coefficient to a high lift coefficient too quickly, with enormous lift loads ensuing. We shall consider in greater detail this question of loads in a later article.

Equilibrium in Steady Horizontal Flight

In Article 1, we discussed the question of equilibrium of forces and movements. For an airplane in steady horizontal flight, we must have

(a) the sum of the lift forces equal to the weight.

(b) the thrust of the propeller equal to the sum of the drag forces of all the parts of the plane.

(c) the movement of all forces about the center of gravity equal to zero.

In Fig. 6, this equilibrium of forces and moments is illustrated for another hypothetical airplane. The plane is supposed to be flying at zero degrees of incidence, with the center of pressure well behind the center of gravity. The lift on the wing is therefore tending to nose the plane down. Accordingly the elevator has to be turned up, so that the tail surfaces carry a downward load L_t.

The equilibrium equation for lift then becomes

(a) $L_{wings} = W + L_{tail}$

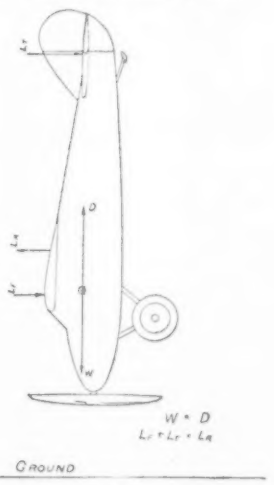
The thrust T of the propeller must overcome the drag of the wings and the parasite drag or the drag of the rest of the wings.

(b) $T = D_w + D_p$.

Then taking moments about the center of gravity, assuming that a stalling or nosing up moment is positive, and denoting the arms of the various forces about the center of gravity by appropriate letters as shown in Fig. 6, we see that

(1) the propeller thrust being below the center of gravity has a stalling moment, +Ta.

Fig. 5. Forces in a vertical dive.



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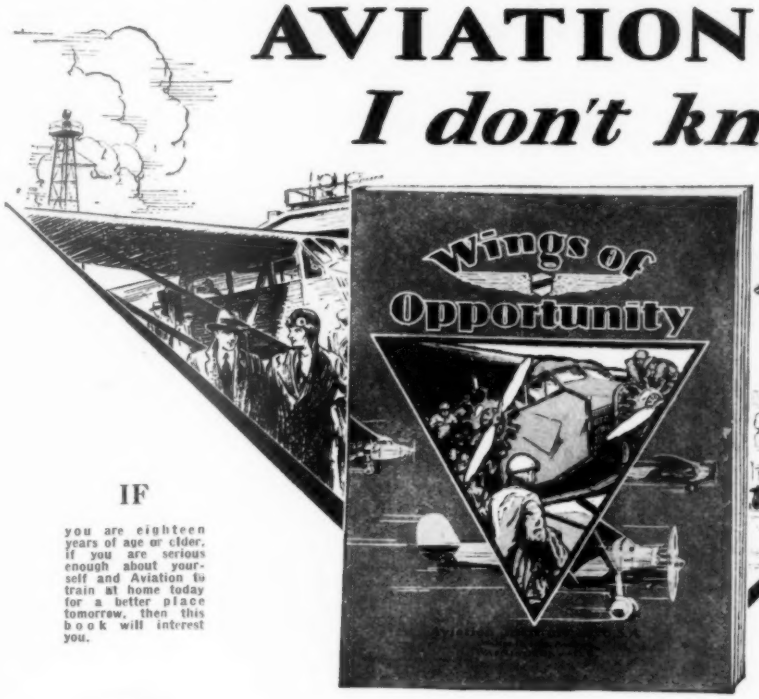

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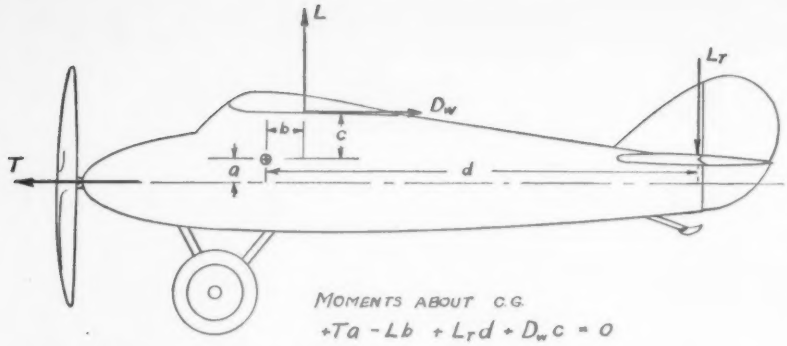

Fig. 6. Forces acting on a plane in level flight.

(2) the lift on the wing has a diving moment—L_w b. about the center of gravity.

(3) the drag force on the wing has a stalling moment + D_w a.

(4) the downward force on the tail has a stalling moment L_t d.

(5) the resultant of the parasite drag is in this case probably below the center of gravity and therefore has a diving moment $-D_p$ e.

The equation of moment equilibrium thus becomes.

(c) $Ta - L_w b + D_w a + L_t d - D_p e = o$.

Example

(1) Our 1600 pound airplane of 200 square feet has a monoplane wing of aspect ratio 6. What is its chord? Let chord be c. Then the span is 6c, and $6c \times c = 6c^2 = 200$. Therefore $c = \sqrt{33.2} = 5.75$ feet.

(2) The center of gravity is placed at one-third of the wing chord from the leading edge and 1½ feet perpendicularly below the wing chord. The thrust line of the propeller is parallel to the wing chord and two feet below it. When the machine is flying steadily at 0 degree angle of incidence, what will be the moment of the propeller thrust about the center of gravity?

At 0° incidence $K_y = .00105$, and $K_x = .000051$. The parasite drag coefficient is .0000325 as before. Now $W = Ky\ AV^2$ so

$$V^2 = \frac{W}{Ky\ A} = \frac{1600}{.00105 \times 200} = 7620$$

and V = 87.2 miles per hour.

$D_t = (K_x + K_p)\ AV^2$
$= (.000051 + .0000325)\ 200 \times 7620$
$= 127$ pounds.

The moment of the propeller thrust is ½ foot below the center of gravity (see Fig. 6), and it will have a stalling moment of $127 \times ½ = 63.5$ foot pounds.

(3) If while flying in equilibrium at zero degrees, the engine is suddenly cut, will the machine have a tendency to stall or to nose down?

The propeller thrust was acting below the center of gravity and gave a stalling couple. When the engine is cut, this stalling moment disappears. The machine will have a tendency to nose down.

(4) What will be the moment about the center of gravity of the lift force?

At 0 degrees incidence, the center of pressure is at 45 per cent of the chord (see Article 5). Therefore the center of pressure is at $5.75 \times .45 = 2.59$ feet from the leading edge, and .67 feet behind the center of gravity. Taking the lift as approximately equal to the weight of the machine, the lift exercises a diving moment of $.67 \times 1600 = 107$ foot pounds about the center of gravity.

Problems

1. For the hypothetical plane of this article, calculate the angle of glide and the air speed for an incidence of 0, 2, 4, 6, 8, 10, 12 and 14 degrees.

2. Calculate the vertical speed in each case of the above problem. Is there apparently some gliding condition for which the vertical speed of descent is a minimum?

3. If you had to make a steep glide into a small field, would you prefer to come in at a small or at a large angle of incidence?

4. If the line of thrust of the propeller passes above the center of gravity of an airplane, and the engine suddenly fails, will there be a tendency to stall or to nose dive?

5. In the example given in this article, the distance from the center of gravity to the point at which the center of pressure of the horizontal tail surfaces may be supposed to act is 13 feet. When the machine is flying at 0 deg. incidence, what force in direction and magnitude will be required on the tail surfaces in order that there may be equilibrium?

6. If the plane we speak of is flying at 6 degrees incidence, what will be (a) the speed (b) the propeller thrust (c) the moment of the thrust about the center of gravity (d) the moment of the lift force about the center of gravity assuming that the lift is approximately equal to the weight?

Answers

(For problem 1 see bottom of page.)

PROBLEM (2)

Angle of Incidence	Angle of glide —	sin—	V sin— = (mph) V vertical
0	4°30′	.0785	7.02
2	4°11′	.0729	5.50
4	4°16′	.0744	4.97
6	4°24′	.0767	4.68
8	4°41′	.0816	4.60
10	5°13′	.0909	4.86
12	5°43′	.0996	5.12
14	6°21′	.1077	5.35

At 8° incidence the vertical velocity of descent is a minimum.

(3) In making a steep glide into a small field it is better to come in at a small angle of incidence. The landing speed will be a little higher but the ship will not have a tendency to "zoom" when flattened out. This would happen if the coefficient of lift were large as in high incidence.

(4) If the center of gravity is below the thrust line there is present a diving moment in ordinary flight under power. When the engine cuts, this diving moment disappears since the thrust is now absent. The plane will now have a very marked tendency to nose up or stall.

(5) At 0° incidence c.p. is at 45% of wing chord or $.45 \times 5.75 = 2.59$ ft. from leading edge.

The c.g. is at 1.92 feet from L. E.

(*Continued on page* 80)

PROBLEM 1

$Kp = .0000325$

Angle of Incidence	Ky	Kx	Kx+Kp	tan— = $\frac{Kx+Kp}{Ky}$	—	cos—	mph V air speed
0	.00105	.000051	.0000835	.0785	4°30′	.997	89.4
2	.00140	.000070	.0001025	.0732	4°11′	.997	75.5
4	.00178	.000100	.0001325	.7045	4°16′	.997	66.9
6	.00214	.000132	.0001645	.0769	4°24′	.997	61.0
8	.00251	.000173	.0002055	.0819	4°41′	.997	56.3
10	.00276	.000219	.0002515	.0912	5°13′	.996	53.5
12	.00301	.000268	.0003015	.1001	5°43′	.995	51.3
14	.00320	.000323	.0003555	.1111	6°21′	.994	49.8

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"Well, yes," I told him. "You're the flying instructor at this field? I want to see you about learning to fly."

"Fine," said the young man. "Let's go over to my office. What aviation training have you had so far?" he asked. I admitted I hadn't any. "But I know that Aviation is the coming big industry in America," I told him. "I know it's a fascinating business for young men, and that it offers the biggest opportunity ever presented for serious-minded fellows. That's why I'm trying to find a way to get started, by learning to fly at one of the big fields."

"You're right about the future of Aviation," agreed the young man. "But you're going about it the wrong way to break in. You say you want to learn to fly. But could you read an air map, an inclinometer, an altimeter? Do you know how airplanes are designed—how weather affects flying? No, of course not. Those things are ground studies—fundamental principles, which you have to know first if you're ever going to be a pilot, or anything else connected with flying. Yet, though they are so important, we can't teach them to you here at the field. At least, if we do, it's an expensive proposition, and we have hardly the time or the equipment to teach you properly.

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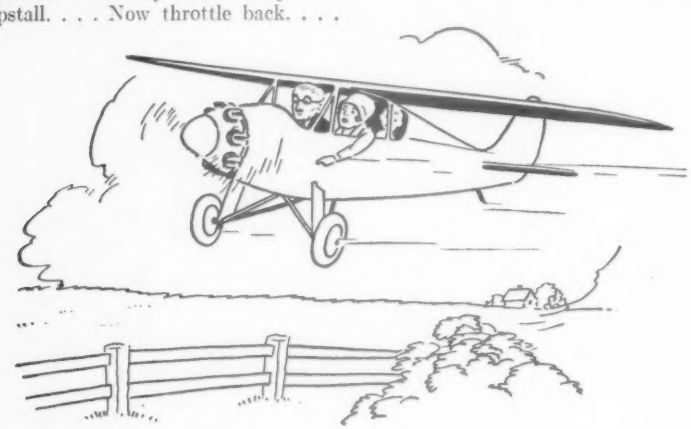
"Look out for that fence, Henry . . . pull back the stick! Do you want to kill us all? Oooo-o-o! I didn't say zoom like that . . . some day you'll zoom once too many and end up in a whipstall. . . . Now throttle back. . . . Henry, DO quit making climbing turns so soon after taking off . . . you know climbing turns are dangerous when flying too close to the ground . . . only last month Mr. Watkins made a climbing turn after the take-off and he's in the hospital yet. . . . Henry, the right wing is dropping a little . . . give 'er a little left aileron . . . now, that's better . . . look out for that plane ahead . . . I don't think he sees us . . . turn to the right, Henry, and dive a little. . . . HENRY! I didn't say do a vertical bank . . . you're frightening Junior to death . . . and close that window tighter, my hair is all blowing . . . watch your left wing, Henry . . . a little right aileron . . . not too much or the other wing will drop . . . this is a terrible cross wind, and the air is bumpy too . . . let's get another 1,000 feet and see if it's any better. . . . HENRY! Please don't climb so steeply . . . and don't fly with the throttle wide open . . . how many revs is she turning up? 1,750? That's too much . . . throttle back to 1,650 . . . watch your oil gauge, Henry . . . I think the engine's getting hot. . . . Isn't the scenery pretty? Look at that little lake. . . . HENRY! Our prop nearly took off that plane's tail group. DO watch where you're going . . . traffic is bad today.



. . . Oh, look! Yonder's the Robinsons in their new airsedan . . . they're flying terribly slow. . . . Now, Henry, if you MUST pass them, please keep out of their slipstream. . . . Oh, we're bouncing something terrible! . . . I TOLD you to keep out of their slipstream . . . turn to the left so we can pass them on my side of the ship . . . I want her to see my new fur coat . . . not too close, Henry; you'll lock wings and we have no parachutes . . . my, but the air is rough today . . . close that other window tighter, sand is blowing off the floor into my eyes. . . . Now, Henry, don't fly through that cloud, for you don't know how thick it is, and we have no turn and bank indicator and you never could fly blind . . . no, don't try to go OVER the cloud . . . go under it . . . yonder's another cloud over there . . . turn to the left, Henry . . . give 'er more aileron, we're skidding . . . give 'er MORE aileron, I say . . . no, not too much, you'll throw us out of the seat . . . level off, Henry . . . give 'er more rudder . . . you don't use your rudder enough when you come out of turns . . . you try to make the ailerons do it ALL . . . what's our altitude? 3,500? That's too much, I'm getting chilly . . . don't dive, Henry . . . you know very well it nauseates me to dive that way . . . throttle back and glide . . . no, don't overdo it . . . do you want to stall and go into a spin? . . . nose 'er down a bit more . . . a bit more, Henry . . . look at those heavy clouds over there . . . I think it's going to rain . . . we'd better start for home . . . how far are we? . . . fifteen miles? . . . we ought to make it in ten minutes . . . my, but it's rough down

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here at 1,500 feet. . . . Henry, you're coming down too low . . . you know it isn't safe to fly under 1,000 feet over wooded country . . . they'll get you for hedge hopping if you don't climb back to 1,500 feet . . . well, I see the field and somebody's fixing to take off . . . circle the field two or three times, Henry, and watch that plane . . . you can never tell what the other fool is going to do . . . he's getting off the ground now . . . drop down a bit lower . . . now come in from the south end of the field . . . no, the SOUTH end . . . can't you see the wind cone? . . . now throttle back all the way . . . nose 'er down . . . nose 'er down some more . . . DOWN I say, we're coming in too high! Do you want to overshoot the field? . . . better side-slip a bit . . . don't give 'er so much rudder . . . that's better . . . now level off and fish-tail . . . nose 'er down a bit more . . . no, don't pull back the stick yet! Do you want to pancake? . . . now she's settling . . . Henry, you hit on one wheel, and you barely missed that ditch back there . . . you haven't made a three-point landing in three weeks and you seem to be losing your sense of distance, direction and equilibrium . . . now open the door and help me out . . . no, the OTHER door . . . and when the mechanic puts the ship in the hangar be sure to tell him to sweep out the dirt from the flooring before we go up again . . . it blows into my eyes something awful. It's your fault . . . you never wipe the mud from your feet before climbing into the plane."

Yeah, it'll be a great life. The real wonder of it will be that, after such incessant verbal aid, Henry will be able to bring the ship down in a landing that the family can walk away from.

Simple Aerodynamics

(Continued from page 76)

2.59—1.92=.67 ft. (moment arm of lift force)

L_w b=.67×1600=—107

T a =½×127=63.5

D_w c =1½×77.6=—116.4

where 77.6=D_w=.000051×200×7620

The net moment is —159.9 ft. lbs. in a diving direction. Therefore a down load on the tail is needed to counteract this tendency. The magnitude of this force is:

$$\frac{159.9-12.3 \text{ lbs.}}{13}$$

(6) W=1600#

A=200 sq. ft.

at 6° $\begin{cases} Ky=.00214 \\ Kx=.000132 \end{cases}$

(a) $V=\frac{W}{AKy}=\frac{1600}{200\times.00214}$

=61 mph.

D_t=(.0000325 .000132) (200)×(61)²

=123#

But D=T

Therefore moment of thrust about center of gravity is

½×123=+61.5 ft. lbs.

The center of pressure at 6° is exactly at ⅓ of wing chord therefore the lift force having zero arm has zero moment.

Club Notes

(Continued from page 26)

One of the most interesting developments in the club field recently is the announcement that a $350,000 aviation country club, sponsored by the United Aviation Corporation, is to be organized near Chicago. The club will have a landing field, with four runways each 500 feet wide and a half mile long. There will be hangars for the club planes and also for planes of the Gray Goose Air Lines, Inc., and the Interstate Air Lines, Inc., both subsidiaries of the United Aviation Corporation. Sky Harbor Clubhouse will be three stories high, and will provide space for classrooms of the Sky Harbor Institute, waiting rooms, a library, club rooms, and card rooms. Terraces and a roof garden will be available for teas and luncheons, and there will also be an observation gallery for the purpose of viewing the flying.

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All airplanes used by us for both instruction and passenger service are planes licensed by the U. S. Government, and our instructors are U. S. Licensed Transport Pilots and U. S. Licensed Mechanics. Our Chief Instructor is Lieutenant Murel R. Bouse, former instructor at the U. S. Air-Service Technical School of Chanute Field, and each and every one of our pilots has more than 1500 hours in the air to his credit. Our equipment is new and of modern design, subject to daily U. S. Government Inspection. (Most schools do not have a resident U. S. Government Inspector on the field—think what this means to you.)

We Guarantee to Qualify Our Students for Immediate Positions

There is money for you in Aviation, if—you get thorough training NOW! Our courses will give you this training—they cover everything about planes, motors, their operation, maintenance and construction. Everything a pilot or mechanic must know to secure a good-paying position. We guarantee that upon completion of a course at our school you will have all the knowledge necessary to qualify you for an immediate position in the particular branch of Aviation for which you have been trained, whether on the ground or in the air.

On the Ground

To make our ground course thorough, intensive and complete, it has been patterned strictly after the course of ground instruction given by the U. S. Government. It covers complete theoretical instruction and practical shop training in Airplane Structure and Repair of various type planes, Aircraft Welding, Wing and Fuselage Covering and Doping, Motor Construction, Adjustment and Repair (Water and Air-Cooled Motors), Motor Testing and Trouble Shooting, Airplane Instruments, Aerial Navigation, etc. Instruction is given on every type of motor—the OX-5—to the larger types such as the Wright Whirlwind.

In the Air

We guarantee sufficient hours in the air to make each student master of his ship; pilot it safely and efficiently by himself. Instruction is given by U. S. Licensed Transport Pilots on four different types of approved modern aircraft—Eaglerock Biplane with OX-5 Motor, Eaglerock with Siemens-Halske Radial Type Motor, Ryan open cockpit Monoplane powered with Hispano-Suiza (Hisso) Motor and Ryan four passenger closed Cabin Monoplane powered with Wright Whirlwind Motor.

"Trouble Shooting on the Flying Line"

This is a vital and essential part of the Von Hoffmann training on all types of planes. It is additional training of this kind which secures and holds positions in Aviation for Von Hoffmann Graduates.

Trained Men Are Needed

The training which the Von Hoffmann student receives is the exact training which he must have to qualify for immediate positions on the ground or in the air. Our courses have been laid out with a single object in view—to give thorough training in all branches of Aviation. Commercial Aviation needs men and there is an ever increasing demand, ONLY for those who have been properly trained—Von Hoffmann gives you this training.

Here Is Proof—

Three Lakes, Wisc.
June 19, 1928.

Von Hoffmann Aircraft School,
St. Louis, Missouri.

Gentlemen:

I feel that I certainly owe you people a letter of recommendation.

When I decided to take a course in Aviation I corresponded with a number of schools, before I left home, and when I did start out I took my car and drove to a number of cities, so consequently visited a number of schools. I was well satisfied, when I enrolled in your school, that it was by far the best school I had visited, and I still feel the same way about it. The courses you have are complete; the instructors surely know how to handle the students, as well as planes; and the equipment is of the very best. Two things I wish to emphasize are the facts that I found everything at your school as you advertised it, and that my first solo flight was with a new Eaglerock plane, used less than thirty hours, which surely shows that you have confidence in your students.

The Eaglerock plane I got from you is doing fine. Just got back from a 500-mile trip through southern Wisconsin, advertising the summer resorts of this district.

Thanking you for the many things you have done for me, I am

Cordially yours,

(Signed) **HAROLD L. GRANDY**

This is just one of the many letters we have received from former students. We will be pleased to send copies of them upon request.

MAIL COUPON NOW!

If you are interested in Aviation, you should know the necessary physical qualifications and what is required by the Government for a mechanic's or pilot's license. Our big, new book, "AVIATION and YOU," tells all the facts. It is FREE. Fill out the coupon and mail it at once—no obligations. DO IT NOW!

Thorough Instruction at Low Cost

We teach you by actual flying and practical instruction; no long course needed. No student bond required. Our ground course gives thorough instruction in ground work and qualifies you for a position as motor and plane mechanic, rigger, electrician, welder, or any other ground position, or you can take the course combining ground instruction and flying which will qualify you for an industrial, limited commercial or transport pilot. The cost is low considering daily flying, the thoroughness of theoretical and ground instruction on latest modern type planes, Wright Whirlwind and other standard motors. Our big new book "AVIATION and YOU" tells all the facts—it is FREE—write for it TODAY!

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317 Lambert-Saint Louis Flying Field,
(Lindbergh's Own Field), Anglum, Missouri.

Send me your big, new book "AVIATION and YOU," giving all the facts about your ground and flying courses. I assume no obligation.

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I expect to start about.....19.....
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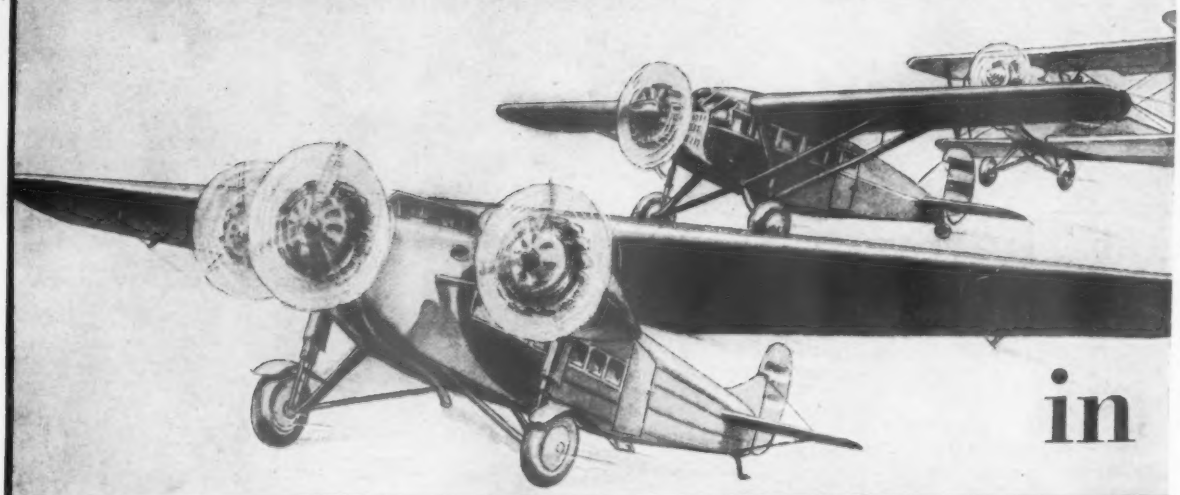

in

Who will fly them? Keep them in repair? Young man, *that's your job*

THERE were only 6,077 pilots and 4,873 airplane mechanics licensed or pending the first of this year. Who then will fly the airplanes that were produced in 1928 as well as the 10,000 new planes which authorities conservatively estimate will be produced in 1929? Who will service these planes? This shortage of trained men, it is widely said, is the only factor that can interfere with aviation's development. Aviation needs trained men. Aviation needs you, young man.

Aviation Offers These Opportunities

For the young man who is qualified and properly trained as pilot and who enjoys the thrill of flying, there will be many opportunities to operate commercial aircraft. And men of a mechanical turn of mind who fit themselves to become aviation mechanics will always be in demand. Business needs men with aviation training. In every field of business that aviation touches upon—and there are dozens—the man with first-hand knowledge of this new industry is going to be at a tremendous advantage. Young man, learn practical aviation now in one of the many Universal Aviation Schools.

Universal Training Prepares You

When you have graduated from any of the Universal Aviation Schools, you know your subject from a practical as well as a theoretical point of view. Universal training is thorough. A pilot's course prepares you for the government examination in whichever grade you have qualified. The mechanic's course qualifies you for examination as airplane apprentice mechanic and immediately puts you on a money making basis. The Aviation Business Course gives you a thorough ground work in aviation

Skimming through clouds — soaring over city and countryside — this is the life for the outdoors man.

Universal

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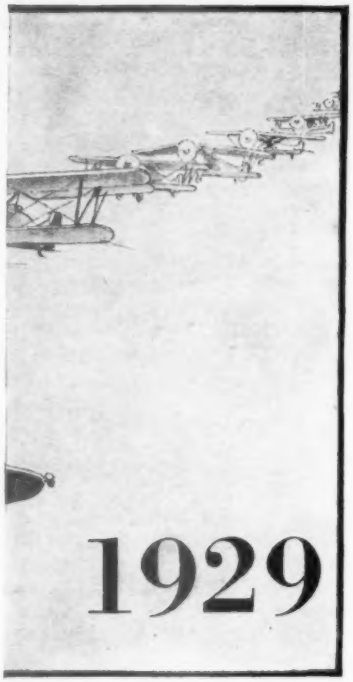
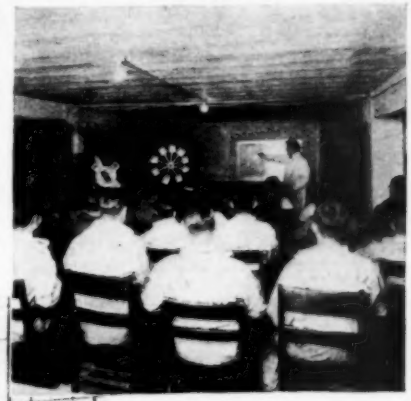
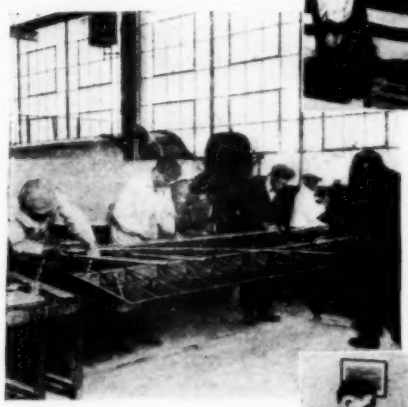
Universal Aviation Schools are owned and ation. This corporation also operates Air St. Louis, Kansas City, Omaha, Cleveland, and passengers. New Air Lines are being exconditions permit. Get your training in the



A ground school course is a part of every flying course at Universal Aviation Schools. The pilot must know the construction of airplanes and motors and be familiar with the theory of Aviation.

Are you of a mechanical turn of mind? Then, take an Aviation Mechanic's Course. The present shortage of trained aviation mechanics will continue for some time.





Aviation touches upon many different lines of business. If you are engaged in one of these, an Aviation Business Course will put you in a position to take advantage of the opportunities offered by aviation's development.

which you may use in advancing yourself in any of the many diversified fields which aviation touches upon. At this date you may practically pick the field in which you wish to specialize, get your training through any one of the Universal Aviation Schools and be assured there is a place for you in the industry.

Facts About Universal Aviation Schools

To supply the present as well as the future need for thoroughly trained men, the Universal Aviation Corporation, a $10,000,000.00 concern operating over 5,000 miles of airways a day, has established a number of aviation schools at various airports out of which they operate. These schools have been given the finest, most modern aeronautical equipment available and have been placed in charge of the most competent instructors in the country.

All instruction meets with the requirements of the Aeronautical Branch of the U. S. Department of Commerce. If you are ambitious, anxious to really get somewhere in aviation and are willing to buckle down to what is perhaps the stiffest aeronautical course in the country, enroll in a Universal Aviation School.

25c Brings This Book

"Aviation—What It Means To You" answers all your questions. It gives you information you should have before you ever decide to study aviation. In a frank, clear manner, without exaggeration, it gives you a true picture of the aviation industry today. Send 25c for your copy. Mail with the coupon today.

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Lines between Minneapolis-St.Paul, Chicago, Cincinnati, and Louisville, carrying air mail tended into other large cities as rapidly as midst of these big, new aviation developments.

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Enclosed find 25c. Please send me the book "Aviation —What It Means to You." Also complete information on ☐ Flying ☐ Mechanics ☐ Business Course.

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Universal Aviation Schools are members of the Aeronautical Chamber of Commerce

Freaks That Flew

(*Continued from page* 12)

At the end of 1918 the aeroplane was a speedy, fast climbing, but exceedingly dangerous and uncertain means of transport. What little interest that had been aroused in this country by the exploits of the "war birds" in Europe quickly died down. The average American wanted something that was useful in peace time. He refused even to be stirred by the two successful flights across the Atlantic and the earlier gallant attempt of Hawker—all in 1919.

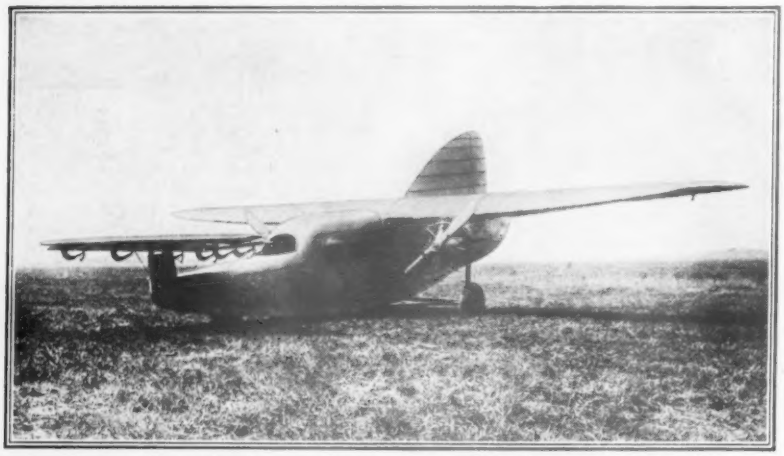
The policy of the government may have had something to do with this apathy. At the end of the war Uncle Sam found himself with an enormous quantity of DH.4 biplanes on hand—a clumsy two-seater that required a four hundred horsepower engine to lift it off the ground. And the latter was also on hand in the shape of the much boosted Liberty, a motor of some merit but short working life. Both plane and engine were obsolete years before they were out of use; yet in consequence of their cheapness and the way they were "dumped" onto the army and Post Office, American aircraft and aero engine manufacturers had little encouragement to produce newer or more efficient types of either.

Undoubtedly the machine which has had the greatest influence on modern commercial aircraft design was the Junkers monoplane of 1920. While not a freak in any sense, it presented several original features. It was entirely of metal, even the wings being covered with thin sheets of duralumin. The latter were tapered, about sixteen inches thick at the roots, and with a lifting power hitherto unknown. Also they were cantilever in structure without any supporting braces or similar resistance-offering surfaces, yet sufficiently strong to carry about fifteen full-grown men on each panel. They were placed below the fuselage instead of flush with or above as had previously been the custom with all monoplanes. Powered with a 185 h.p. engine, it carried seven people. Its present use on the great German lines and its adoption with slight changes all over the world has proved its success.

The more efficient single wing was coming back into its own. In 1921 an Italian designer named Jacuzzi resident in California manufactured a machine somewhat resembling the Junkers and started a passenger line between San Francisco and the Yosemite. Unfortunately before the company was in actual operation the designer, the engineer, and a well known pilot were killed while on a long distance flight in a crash the cause of which was never learned.

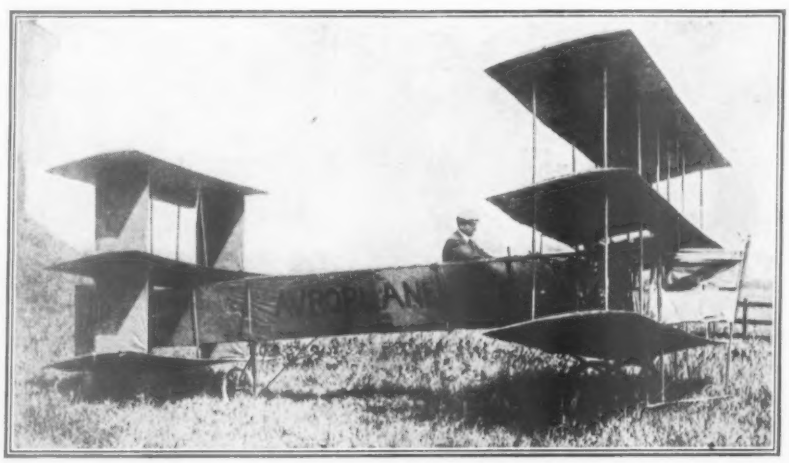
The Jacuzzi monoplane was a seven-seater cabin machine built of wood and fabric with a fifty foot span and slightly tapered wings. The power plant was a 200 h.p. Hall Scott motor. Aeronautical critics, however, took exception to the bracing of the wings which was in the form of Y-shaped spruce struts having the lower ends fastened to the axle of the undercarriage. Although this kind of bracing is seen slightly modified on modern three-engined planes today, it can never be classified as ideal, the slightest roughness in a landing communicating itself to the more delicate planes instead of being confined to a cheap and easily repaired damage of the chassis.

A far more original and much neater design by an American was the Loughhead single-seater biplane exhibited at the Aero show in San Francisco in 1920. This little machine was a precursor of the light aeroplanes so popular at present in Europe. It was manufactured in Santa Barbara, California, and great care and attention to detail had been lavished on the finished product. Apart from the monocoque fuselage of three-ply wood, light and sturdy yet no thicker than one-eighth of an inch, there were other and more interesting features. The two cylinder, horizontally opposed, water cooled engine, also a product of the same firm, was entirely cowled in, the radiator being placed below the body. The latter is a practice prevalent in latter-day U. S. military types. The wings were folding, allowing the machine to be stored in a garage ten feet wide. But the most notable peculiarity was that there were no ailerons or warping surfaces. Lateral control was effected by tilting the entire panel of one or other of the lower wings by means of a lever near the pilot's seat. As no official record of the Loughhead biplane's performance is available the success of this feature is unknown. It was claimed the landing speed was only 30 m.p.h., and as the single-sparred lower wing could be swiveled to a vertical position immediately upon reaching the



This German plane has its stabilizer in front.

A 1910 Avro.



TRAIN AT AMERICA'S MOST FAMOUS AVIATION SCHOOL

It means something to be a

RYAN GRADUATE

This scene is not an "Air Meet"! It is an actual photograph of a part of the flying equipment used by the T. C. Ryan Flying School. Note the large variety of modern licensed planes in which students receive flying experience.

RYAN GRADUATES ARE EXPERT PILOTS . . . EXPERT PILOTS ARE IN DEMAND

There's a vast difference in aviation training. Investigate thoroly. Be sure you get the best.

Hundreds of so-called flying "schools" claim they can turn out finished pilots in 10 hours' flying time. We tell you frankly—it CANNOT be done. A really competent pilot for *commercial* flying cannot be trained with less than 60 hours in the air and four months' ground training; a safe pilot for *private* flying cannot be produced with less than 20 hours in the air and two months' ground training.

Aviation experts will tell you that the T. C. Ryan Flying School at San Diego, California, is offering two of the finest flying courses in America. Ryan students—because of long, thoro training under ideal flying conditions, competent staff of licensed instructors *and many types of licensed planes*—are better qualified to fill the important flying and executive positions which are opening up on every hand.

CLASSES NOW ENROLLING

No delays! Every day is a flying day in San Diego—the charming city on the edge of the blue Pacific. San Diego knows no winter, no sleet or slush or snow, no freezing temperatures, no high winds or serious storms. That's why two great U. S. Government flying schools and many other aviation activities are active here—every day in the year. Resolve to become a part of this fascinating activity NOW.

NOTE: *All training is done under the personal supervision of T. Claude Ryan, pioneer of aviation for 12 years. Mr. Ryan is the original designer and builder of Ryan monoplanes, and founder of Ryan Airlines, Ryan Flying Co., T. C. Ryan Flying School and T. C. Ryan Aeronautical Corp.*

TYPICAL WINTER SCENES

in San Diego California *"Air Capital of the West"*

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The T. C. Ryan School specializes in a complete course covering four full months—with 60 hours in the air and thoro ground training—qualifying you for a Commercial License.

Also a Private Operator's course, covering two months—with 20 hours in the air and primary ground training. Also *Advanced Work* for those who have had previous training.

T. C. RYAN FLYING SCHOOL, Dept. E, Ryan Airport, San Diego, Calif.
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Learn to fly with RYAN at the T. C. RYAN FLYING SCHOOL

ground, an efficient air brake was provided.

One must not forget that every one of the "freaks" described in this article flew. Of the countless atrocities that never left the ground no man will ever know; they were as the sands of the seashore. Also, it is well to remember when reading of some endurance contest or long distance flight that the pilots of a few years back had neither the splendid machines nor the reliable engines we have now. Yet, taking both these facts into consideration, there is hardly a present day stunt that has not been excelled by the earlier flyers. And the American pioneer aviator and constructor perhaps deserves more credit than any other; he least of all has had any support from press, public, or government.

Aerial Navigation

(*Continued from page* 62)

know at least the principles underlying the tables and instruments that will be in constant use.

Under certain conditions a "fix" on a Sumner Line may be obtained by a bearing of some distant terrestrial object in conjunction with the sun. The sun's position can be laid down on the chart at any time and the procedure is then similar to the "cross bearing" method described in the first article of this series. In taking bearings of distant terrestrial objects great care is necessary as an error of one degree in bearing with an object fifty miles away will mean an error of one mile in position. The ideal position for this "celestial-cum-terrestrial-cross-bearing" is with the sun bearing exactly over or in an opposite direction from the terrestrial object. The nearer the right angle the better the "cut."

In practice instead of working and reworking longitude observations with various latitudes and afterwards plotting two position lines, the longitude sight is worked once, the sun's True Bearing is obtained from tables provided for the purpose. The data used in these tables are the hour angle, just obtained by observation, and the same latitude and declination as were used in the longitude calculation. Rule a line on the chart at right angles to the sun's true bearing and a Sumner Line is the result. It should be mentioned here that when the altitude is high, say 80°—85° the circle is small and if even a very small portion of the circumference is taken it will be observed that the altitude of the sun, if measured from the two extremes of the arc, will differ an appreciable amount and so the line of bearing will not be as accurate as if the altitude were less and the circle correspondingly larger.

So far it has only been demonstrated that with a single altitude we can determine a circle of position upon some part of which the observer must be. If then another circle of position can be obtained the observer must be somewhere on both of these circles, i. e., at their intersection. This result can be obtained by (a) Two observations of the same celestial body, allowing for the progress of the ship or plane between the two observations; (b) Simultaneous observation of two or three celestial bodies. The first is clearly demonstrated on page 60, except that it has been assumed that the observer's position did not change between observations. In practice, however, a plane or ship is seldom at rest between observations, and hence, our first circle of position must be moved bodily in the same direction and the same distance as the observer has moved between observations. When dealing with position lines the same process must be followed, and the first line must be moved parallel to itself in the same direction and the same distance as has been made good between sights. The point of intersection with second position line will be the ship's position. The double altitude problem (page 62) is not of very great value to the swiftly travelling airman; but some of the principles involved will help us later with our "star work." If the reader wishes to study the actual calculations involved in double altitude problem, he is referred to Bowditch, Noni, Johnson's On Finding the Latitude and Longitude in Cloudy Weather, and A. C. Johnson and Rosser's The Shortest Method of Finding the Latitude, Longitude, and Azimuth — Johnson's method is preferred by the writer.

Circles of equal altitude, "Sumner Lines," "double altitudes" are equally applicable to sun, moon, stars or planets —so that it is rarely necessary to wait for a double altitude of one celestial body.

The sky is full of bodies suitable for "simultaneous observations" or "astronomical crossbearings," and the use of this method eliminates the chance of error inherent to the carrying forward of a line of position and also does away with any "wait" between observations which is always tiresome and which in aerial navigation might very easily become dangerous.

Women Who Fly

(*Continued from page* 34)

One of the quaintest episodes I ever had was when a certain gallant old lady implored me to take her up and loop with her at one of my flying garden parties. I do not like taking passengers around, except very gently. One always wants to make them fly again—but nothing would keep her from looping, so I took her up. When we reached an altitude of about 500 feet and I glanced at the passenger's seat which was in front of me in my little Moth, there was no passenger to be seen. Heavens! thought I, the floor boards have given away and dropped her out, and I stood up in my seat and leaned forward to look into her cockpit.

To my great amusement I saw my gallant would be "looper" crouched on the floor, with her head between her knees, holding onto everything she could find. I did one or two gentle turns, floating about the sky for a few minutes, and then glided onto the ground with her. As we taxied up to the group of friends who were sitting at the tea tables, she sat up and powdered her nose gaily. "Oh! my dears," she cried to them, "you must go up. Looping is just wonderful!" Women frequently fly when they want to go to the continent from England, or anywhere else where there are airlines to be found. Last time I booked a seat on a plane my next door neighbor was a sweet little girl going back for her last year to her convent school at Brussels. When she grows up she will have the air sense already developed in her, as will all our women of the future. Modern aviation is so safe that there are few thrills in it, if one just goes in for straight flying, but it can be made as exciting and as dangerous as we could wish. There are uncharted territories, great deserts, and vast jungle lands to be flown over, and air racing, when one's engine, one's machine and one's own nervous power are all strained to the utmost, is also dangerous. There is, however, a world of amusement still to be gotten in this new sport.

The Uncovered Wagon

(*Continued from page* 23)

whipped the plane into a descending spiral. My first notion was that we had been thrown into a tailspin. I didn't fear a crack-up so much as I feared that we would not crash hard enough. When we came out of it we were on the ground, and in a blizzard of increasing fury. The tail skid and the right wing skid were broken. Only extraordinary piloting landed us with so little damage.

We were a couple of hundred yards from a pumping station near Grenville, 135 miles northwest of Cheyenne, and seven miles from Rawlins—later to provide an emergency landing field near where we came down.

The storm was threatening to take our two-ton ship into the air again, and we had barely succeeded in lashing it to the ground with ropes and pickets, when a flivver truck came bounding through the

XUM

We Train You For SUCCESS!

Derek White, President of the Guardian Air College personally supervises all instruction. Formerly General Manager of two other great air schools before organizing his own, with longer courses and more personal attention to students.

Anything less than the training that will prepare you to *hold* a position, not merely *get* one, is wasted time. That is why the Guardian Air College was founded, to give the training found over a period of years to be necessary for complete success in commercial aviation.

Full Training

Experts, with years of instruction experience have laid out, and teach the Guardian Course under the direct personal supervision of Derek White, formerly General Manager of two great air schools, one of which advertised him as the "highest paid air school executive in the world!"

Here at Guardian we teach you airplane construction, repair and maintenance under modern conditions. You are taught motor work on modern engines, water and air cooled. You build every part of airplanes and tear down, adjust and assemble engines. In addition you are taught aerodynamics, airplane drafting, welding, airport management and other subjects.

From top to bottom, engineering lecture in the classroom; working on a new air cooled engine; repairing a fuselage, and welding instruction.

Richard F. Hardin, General Superintendent of the Guardian College. Formerly Superintendent of the largest civilian air school in the world and chief engineer of an airplane plant. Now with Guardian because he believes in a small school with close, personal training.

No Flying

Guardian does not welcome men dazzled by the glamour and romance of flying alone. Many splendid pilots are making splendid incomes flying, but we genuinely feel that there are more positions, more opportunities, more money and a more glorious future on the ground than in the air. So we do not teach flying, but train men serious about their future, for the mechanical, industrial, executive and engineering positions. Many men who finish our course and start as mechanics will rise high in the industry.

Factory Conditions

Your airplane and engine work is given right in the Guardian plant, where we are rapidly getting into production on Guardian Monoplanes. You then are taught to build jigs and fixtures, factory production methods and receive a breadth of training not given in ordinary schools.

Special Offer

Right now we have a special offer that saves exactly half your tuition cost. We allow you to earn this amount working for us. This, we feel, is the greatest and most generous offer ever made to aviation students. Now is your opportunity. It is greater now than ever before, or will be again. Send the coupon *at once* for your copy of "Heavens Filled with Commerce," which will convince you of the superiority of Guardian training. Mail the coupon *now,* before you turn the page.

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snow. A robust middle-aged Dane, ruddy of face and blue of eye, stepped down from behind the wheel and came toward us. His white mustache and bushy eyebrows were exaggerated and picturesquely emphasized by the ridges of snow which had formed on them. Smith recognized him as H. Larsen, patron saint of mail pilots in the Rockies. He was a lumber merchant whose avocation was pulling aviators out of snowdrifts. He smiled a greeting, and without superfluous conversation went to work, helping us to cover the engine with tarpaulin and in other ways prepare the plane for a night in the storm.

In half an hour we were breasting the storm on the road to Rawlins. Larsen's skill in keeping the little truck on the blizzard-swept highway, which was hardly visible, was comparable to Smith's with a storm-tossed mail plane. Soon we were at Larsen's comfortable home.

Next morning a mechanic came from the Rock Springs station with spare parts. He completed repairs by noon, and, Larsen having refuelled us, we took off over the mountains. In a few minutes we were crossing the Continental Divide at nine thousand feet. An hour and a half later we landed at the foot of Table Mountain and were at the Rock Springs air mail station. Field Manager Albert J. Poetz, a gifted extempore cook, gave us an appetizing handout while his mechanics checked up and serviced our plane.

Through Snow Storms

At three o'clock, with scant time to make Salt Lake City by nightfall, as we thought, we hopped over Table Mountain and found ourselves with a bird's-eye view of some of the most weirdly beautiful winter scenery in the Rocky Mountains. To the south of us, the long jagged range of the Uinta Mountains stretched westward, colored in the sunset with every tinge of the rainbow. The slanting sun itself shone directly in our faces when it was not obscured by clouds. Snow-capped peaks towered on either side of the airway. We travelled through passes where we could, bucking a forty-mile wind and flying through the lighter clouds, dodging the darker and heavier ones. We sailed through or around a dozen snow storms and flurries.

Passing over Porcupine Ridge at ten thousand feet, we coasted down toward Salt Lake City. The great Salt Lake itself materialized through haze off toward the northwest. The sunset was something to marvel at in silence—or as much silence as a 400-horse-power motor permits. The brief twilight of this region was nearing its end, and the lights of the city twinkled up at the stars above our top wing as we crossed over the Mormon capital. Darkness veiled its beautiful setting as the motor was throttled for the landing. The exhaust pipes belched flame in blinding flashes, and for a moment I thought of "flaming coffins."

Unfit for Flying

We had flown the 150 miles from Rock Springs in two and a quarter hours; the two thousand miles from New York in twenty-six and a half hours of flying time; but I had been a week en route. The newly reconstructed plane in which I had left the Atlantic Coast landed at Salt Lake with broken and trailing wires, and the forced landings in Nebraska and Wyoming had otherwise used it up so badly that it was declared unfit for further flying pending a general overhauling. Field Manager A. Claron Nelson was amazed that it had held together against the buffeting it had received over the mountains. It moaned and creaked protestingly when he shook it.

"Another good twister would have draped you over a mountain peak," he remarked, as the mechanics rolled it into the hangar.

Loosened Teeth

Like most of the other mail planes I had seen, it was a military olive green in color. At sunrise next day I and my transcontinental mail were loaded into the bright orange-colored ship of Pilot E. E. Mouton, sometime member of the Lafayette Escadrille. The Salt Lake air mail field of those days was one of the worst on the route, and it was necessary to hurdle steeply over telephone wires at one end of the short runway. This maneuver loosened several of my back teeth. It was preliminary to hurdling the awesome Ruby Range at 13,400 feet, with less than a hundred feet of clearance and some of the roughest flying I have ever experienced. But two and a half hours after leaving the Utah capital we landed at Elko, Nevada.

Field Manager Barbour sent us off toward Reno in a stiffening wind. As we neared the edge of the Alkali Flats things began to happen. A seventy-mile hurricane rushed at us from behind Granite Peak, and in the next few minutes seemed undecided as to whether to dash us against a mountain or throw us to the desert floor. It compromised by blowing us into a terrific dust storm, which we were told afterward was the worst the Nevada desert country had seen in years.

A Desert Landing

The storm had forced Mouton far off his course when an overheated engine compelled him to find a landing place. How he got us down without spattering us over the Nevada landscape I never have comprehended. We landed on the desert, after bouncing over or crashing through half a dozen clumps of sagebrush, with a broken right wing.

It was just past high noon when we came down, but it couldn't be proved by the sun, which was invisible in an atmosphere full of swirling dust. We crouched for four hours in our cockpits, waiting for the storm to die down. We were unable to see ten feet in any direction. It was nearly five o'clock when the sun became faintly visible not far above the western horizon. In the dusty haze it appeared as a light green disc, the work of an impressionist scene painter.

Wearing Out Shoes

We discussed whether it would be best to wait for a rescue party or start on foot in the general direction of a ranch which Mouton had seen from the air. Shortly after five o'clock, with darkness coming on, we decided to start out, armed only with a broken wing skid against night-prowling mountain lions or wild cats.

There are more pleasant forms of exercise than walking over the mushy "self-rising" ground of the Nevada desert country, especially when the stroller is dressed in heavy fur-lined flying clothes. I was to learn that a lot of shoe-leather can be worn out in cross-country flying.

Darkness descended quickly, and a light snow began to fall. The sky was cloudy, but there were a few stars to steer by; and Mouton was aided in his orientation of our course by two mountain ranges. We learned later that we were in the Buena Vista Valley.

We trudged through the desert all night, walking until it became necessary to rest, and resuming when it became too cold to rest any longer. . . . That sunrise was the most beautiful I have ever seen anywhere in the world.

Skulls and Bones

During the night we had begun to fear that we were not on the right course. We were without water or food, and stories of men lost in the desert under such circumstances, and what happened to them, came easily to mind. The occasional sight of a whitened skull—although those we saw were of animals—didn't help any.

But the clear winter morning was not far advanced when we saw a ranch in the distance. Mouton's calculations had been about perfect. We trudged on, and reached the Hudgins ranch house before noon.

D. E. Hudgins told us later that we had walked about twenty-five miles. An eastbound mail pilot had last seen us as we passed Battle Mountain in the storm, and when we did not arrive at Reno it was thought unlikely that we could have

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lived through a forced landing under the circumstances. Newspapers reported us as probable casualties of air mail pioneering.

Hudgins said we had been lucky to escape attack in the desert by crazed coyotes. A coyote in its right mind will not attack a man, but Hudgins told us that a ranger had conceived the brilliant notion of inoculating several captured coyotes with rabies germs and turning them loose in the desert, figuring that they would spread hydrophobia and kill one another off. Instead the crazed animals had come boldly into the ranches, attacking human beings and animals indiscriminately. Four men had lost their lives.

We saw one coyote, but evidently it was not infected, for it scampered off when we approached.

From the ranch Mouton telephoned the Reno air mail station, reported that we were safe, and learned that planes had been sent out to search for us. Pilot Farr Nutter, when his fuel was nearly exhausted, had seen on the desert something that appeared to be a burned and wrecked plane. He had flown on to Lovelock, the nearest town, for more fuel, intending to return and investigate further. He was reached by telephone and informed that we were safe.

Half a Howl

Mouton gave directions as to the position of the plane, and instructed Pilot Raymond J. Little, who also was about to start on a search for us, how to find it in the desert. Then Hudgins drove us in his automobile, over the roughest motoring over land I ever experienced, back to the scene of the crack-up. We arrived in time to see Little circle high over the desert and head for Lovelock. He had failed to find the ship, mainly because of its orange color against the sandy background of the desert, and his fuel had given out.

We returned to the ranch, where Mrs. Hudgins made us comfortable. Hudgins, after supper, was telling us undoubtedly interesting yarns of his stagecoach days when his wife, noting that Mouton and I were falling asleep in our chairs, interrupted him.

"These boys probably have had enough adventure in the last couple of days," she said. "Let's put them to bed."

A few minutes later, in the depths of a feather bed, I heard a coyote begin to howl. He finished without an audience, so far as Monte Mouton and I were concerned.

Next morning Mouton telephoned more detailed instructions to the pilots at Lovelock, and Hudgins drove us back to the stranded plane. Shortly after noon Little landed beside it.

On the way to Reno we stopped at Lovelock for fuel. A crowd of townfolk and ranchers, Indians and Mexicans, watched us land. A rumor had spread that our bodies were being brought in from the desert.

Taking off again, we headed toward the Sierras, and, flying over the beautiful Pyramid Lakes, we landed at Reno late in the afternoon.

Because of a shortage of planes on the mountain division, due to my mishaps and others, Little's plane had to be sent to Salt Lake City next day for mail which had been delayed by stormy weather and accidents, and there was nothing for me to do but wait. On the day following, the ceiling over "the hump" was too low and I was again delayed.

The Thirteenth Day

On my thirteenth day out from New York, Field Manager Tomlinson of the Reno station sent me off for San Francisco—the last hop. Pilot Little was taxiing the plane down the field for the take-off when he discovered that three or four cylinders of the motor were missing. This was an excellent time to find it out, rather than over the Sierra Nevada Mountains. We changed to another plane and got away, shortly before noon.

The sky was fairly clear, and we were soon over the white peaks and ranges of the Sierras, austerely beautiful in winter. Safely over "the hump," we caught a tail-wind which carried us swiftly down the Sacramento Valley.

The Golden Gate and the Pacific! . . . Circling over the Presidio for the landing. . . . Ninety minutes after leaving Reno our wheels touched the ground at San Francisco—a night's journey by train. My flying time from New York had been thirty-three hours and fifty-one minutes; but the elapsed time was nearly a fortnight. The transcontinental schedule now calls for through delivery of mail from coast to coast in less than a day and a half. And the pioneer days of the uncovered wagon of the airways are history, along with the covered wagon of the Overland Trail.

Congress Refuses Money

At the time when my flight was made, so convinced was a large section of Congress that the Air Mail was an impossible experiment, resulting only in unwarranted loss of life and destruction of government planes, that the House Appropriations Committee refused to appropriate for its continuation. This action was taken on the day Mouton and I took off from Salt Lake City. Most of the pilots were convinced that they would soon be out of jobs.

I had talked with many of them, and had myself observed the disorganization for which incompetent division superintendents and field managers were to blame. My report coincided with a formal public protest which was made by the pilots. An investigation was followed by the discharge of several officials and a reorganization. The Senate restored the appropriation which the House had thrown out, and the Air Mail went on.

There had been twenty-nine fatalities before the reorganization became completely effective. In the following year, 1922, only one pilot was killed in 1,727,265 miles of flying.

I have sat at many an aeronautical banquet and heard high praise heaped upon the head of this or that politically appointed official under whose administration the Air Mail advanced and became successful, but I have joined in the applause only when the speaker got around to mentioning the pilots.

Financing Air Transport

(*Continued from page* 16)

of any aeronautical enterprise. This is particularly necessary in air transportation because of the very limited range within which the airplane can compete with surface agencies, the present extraordinarily high costs of producing air transportation and the necessarily low margin of unit profit to be earned. Survey of the air transport companies of the United States for 1927 shows that total gross revenues fell approximately 20 percent below total costs of operation. The condition for 1928 was very materially improved from that of 1927, but there are still many really major operations that will fall short of earnings sufficient to set up reasonable reserves necessary to such an enterprise plus a fair profit of investment.

Private Ventures

When it is remembered that most of the established air transport companies of the United States operating regular schedules started either as private ventures financed entirely by the operator or close corporations which neither issued promotion stock nor paid commissions on the sale of stock, their failure in 1927 as a whole to earn profits becomes more significant to our purpose. These companies had available 100 cents out of every stock dollar for purposes of installation and operation. It is to be presumed that as a whole they exercised economy and good business judgment in management to as great an extent as would any other similar group. What extravagances were practiced and what errors committed might be expected to reappear with the establishment of as many more similar operations, for these

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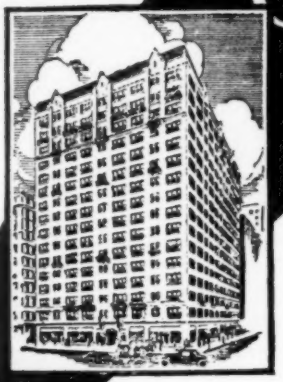

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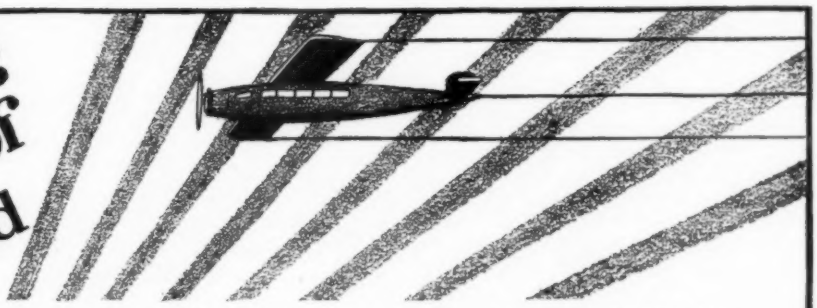

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were individual faults of judgment rather than calculable mistakes.

If these companies which were launched without any impairment of their capital as an industry failed to reach a definitely profitable basis, how much further from profits would they be if twenty percent of their capital stock had been taken out in promotion grants and another twenty percent paid in stock sales commissions? I question if any air transport operations yet established could survive such toll. For the present, at least, such operations should be financed insofar as possible without premium. Issuance of promotion stock should be precluded and every stockholder required to pay for his holding. If a feasible venture in air transport cannot be financed by private subscription on a no commission basis, public offering of the stock should be made on a margin of extremely modest commission.

Financing Air Transport

Any sound air transport project, undertaken seriously with a thought to making money from manufacturing transportation and planned with due regard to conditions of operation and traffic volume on the proposed route can attract adequate finances without resort to exorbitant premiums. And the offering of such premiums should sound warning that even if the promoters take their enterprise seriously it cannot survive.

There are in the United States today some 21,000 miles of commercial airways linking up most of the major cities of the nation. Over this network of airways, air transport companies holding mail contracts with the federal government operate daily transacting 90 percent of the regular air transportation business of the entire country. These air mail lines comprise the major portion of the companies included in my survey of revenues and costs. Despite the fact that as a group they have not established themselves on a profitable footing, they are, because of their mail contracts, best able to expand and extend their services to meet national requirements. There are, perhaps, another 10,000 miles of airways that may within the next two or three years warrant air transport operations.

Determination of the potential value of any air transport stock should be based upon consideration of the character and background of the men sponsoring it; the financial program proposed; the route to be flown and type of equipment contemplated and the surface traffic between points along the route. Only when every detail is favorable can air transport, for the present, hope to prove profitable.

Mussolini Pilots Italy

(*Continued from page* 15)

tance of their route is 1,010 kilometres and during the entire year of 1927 their planes flew a distance of 309,364 kilometres carrying 2,306 passengers as well as baggage, mails and freight. According to their "statistiche" for 1928 they flew a distance of 485,526 kilometres and carried 3,041 passengers. Their regularity for 1928 was 94% as against 76% of the year previous. The Transadriatica planes use the Littorio airport at Rome calling at the S. Nicolo Lido field at Venice and the Aspern Field at Vienna.

One of the most recent companies to inaugurate passenger services is the Avio Linee Italiane who fly their tri-motor Fokkers over the mountains between Milan, Trentino, and Munich in Germany. Owing to the height of the Apennines and the treacherous weather that is often encountered in the Padua Valley this route is regarded as one of the most difficult in Europe, yet during last year they were able to complete all of their scheduled flights. Because of the severe weather that prevails over this route they are forced to suspend their services from October until March. While a very new line, the Avio Linee last year until October 15th made 347 flights making a total of 55,066 miles and since its inauguration the company has carried 837 passengers, 14,646 pounds of freight and 71 pounds of mail. A new connecting line from Milan to Rome was opened at the end of last October. The Fokkers used in the exploitation of these lines were built in Holland and are powered with three Armstrong-Siddeley "Lynx" motors each.

Albanian Service

The Societa Aerea Mediterranea of Rome operates an air line between Rome and Terranova, Pausania and Cagliari on the Island of Sardinia as well as the line between Brindisi in Italy and Valona across the Adriatic in Albania. This company recently took over the lines formerly operated by the Adria Aero Lloyd in Albania. One of these services is between Tirana and Scutari, a distance of 95 kilometres that requires an hour in the air and which is flown twice weekly. Another is the line between Tirana and Koritza, a distance of 125 kilometres which is also a twice weekly service and there is a thrice weekly service between Tirana and Valona which is a short flight of 100 kilometres. For flights over water this company makes use of Savoia 55 flying boats powered with Isotta Fraschini motors while one engine Junkers F-13 monoplanes are used on the overland routes in Albania.

Besides flying boats such as Dornier Wal, Cant, Macchi, and Savoia, already mentioned, there are some other outstanding Italian planes worthy of mention such as the Breda, the Fiat and the various types of Caproni planes. Breda and Fiat planes are used extensively by the Italian military services although these two manufacturers have made efforts to popularize types intended for private ownership. The Fiat biplane is a product of the well known automobile plant and is usually powered with a motor of the same manufacture. Caproni has produced many prototypes and at present the Italian military service is using a number of Caproni bombers which are conspicuous by their lower wings which have a greater spread than the upper while the power plant is placed over the fuselage. One of the latest products of the Caproni plant is an adaptation of the English De Havilland Moth which is being built for private ownership. According to reliable information there are forty privately owned planes riding the breezes in Italy's blue skies. There is considerable speculation over a plane which is said to be under construction in the Caproni works for a transatlantic flight.

Italian Patronage

It is interesting to note who uses the Italian planes among visitors from other nations. It has been seen that Italian lines go to Spain, Austria, Greece, Turkey, Yugoslavia, Albania, Germany and Egypt among foreign nations yet after Italians the largest number of customers on these lines are Americans. According to figures obtained by the writer, a total of 1,732 passengers were carried on all Italian lines during July, 1928. Of these 1,151 were Italian, 218 were American and 109 Austrian while the rest were divided among those of other nations. In August of the same year the total for all lines was 2,029 of whom 1,325 were Italian, 261 Americans and 133 Austrian. The Italians themselves are becoming a very air minded people and are making use of their air systems more every year. Such events as the last Schneider Cup Races, which took place at Venice, and various Italian endurance records have done much to attract nation wide interest in aviation.

Government Airports

In two years the Italian government has spent more than 100,000,000 lire on air fields and the installation of lighting systems. All of the airports used by the commercial services belong to the Government and are under the immediate control of a Director General of Airports.

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Practically all of the air fields used at present in Italy were built by the State while various private organizations are planning to have their own fields in the near future. Probably one of the most interesting and important of the air fields used by the commercial air systems of Italy is the Aeroporte del Littorio of Rome. This airport is operated by a government organization known as the Compagnie Nationale Aeronautique and is owned by the State and the city of Rome. The work of making this big field, whose present dimensions are 2,000 metres long by 1,300 metres wide, into a modern airport from a field on which goats grazed was begun in July of 1927 and it was inaugurated with fitting ceremonies on April 21, 1928. The principal hangar, which is unusual in construction, is a two story structure of striking design. A long inclined runway extending from the second level to the ground makes it a comparatively easy matter for planes to enter and leave the hangar under their own power. The doors of the ground floor open out on to the field on the opposite side of the hangar to the runway. The location of this airport is at a short distance from the limits of the city of Rome and plans are now being made for better transportation facilities so that it will be within a few minutes ride by public conveyance from the center of Rome. The seaplane station known as Ostia Fiumara is situated a short distance from Rome along the shores of the Tiber.

Mussolini Responsible

The foregoing covers a development of commercial aviation that has taken place within the past three years under the influence and leadership of a dynamic character whose statesmanship has produced very definite results in the many phases of government. Mussolini has in a remarkably short time built up a system of airways that compare very favorably with those in operation in larger and more powerful countries in Europe. The military air forces rank with those of France and England and while France is said to maintain the largest military force in the world the Italian forces are among the first three in Europe. To Americans Italy's air development should be of special interest for as was pointed out at the beginning of this article, it is carried on in much the same manner as our General Mitchell would have it managed in these United States. It would be difficult to picture commercial aviation in Italy as it is now developed without the impetus and drive of Mussolini behind it, and regardless of the criticisms of his many adversaries, which naturally spring up to oppose any dictator, he has done a good job with the aeronautical development of his country.

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Model Builders' Department

By Bertram Pond

Details of the Third National Playground Miniature Aircraft Tournament 1929

THE 3rd Annual National Contest Finals of the National Playground and Recreation Association of America is one of the most prominent model airplane activities of the year and POPULAR AVIATION AND AERONAUTICS has the pleasure and distinction of furnishing prizes and medals for this important contest. From now until the contest each issue of POPULAR AVIATION AND AERONAUTICS will contain a description of some particular model which fulfills the requirements of the contest rules. These models will be taken from the prize winners and record holding models from previous contests. You will be given all details necessary to make any of these fine machines.

Beginning with this issue with the Indoor Duration model, you will be given next the Morris World Record Hydro Model, a new type of fuselage model and a compressed air motor, tank and model. Get started now, read the following rules over very carefully and preserve this issue with the plan of the Indoor model and the contest rules for handy reference in preparing for this contest.

We have aimed to give the announcement of the contest far enough ahead this year so that everyone will have ample time to prepare for all events in the contest.

A Manual Prepared

In order to meet the unusual demand on the part of boys, recreation workers, scout leaders, teachers, and others for adequate information on model aircraft the Playground and Recreation Association of America has had prepared a complete manual entitled "Building and Flying Model Aircraft."

This book contains the results of 15 years' experience in building and flying models by the author, Paul Edward Garber, Assistant Curator of Engineering, Smithsonian Institution, Washington, D. C. In addition it is also based upon the experiences gained by the Association in conducting the National Playground Miniature Aircraft Tournament.

The book contains all necessary information for one to learn to build and fly model aircraft; also complete instructions on conducting contests. Local committees are urged to make this book available to all boys and girls interested in this fascinating sport. Copies may be secured from P.R.A.A., 315 Fourth Avenue, New York City. *Price* $2.25.

You will note that the sizes of the models for the events for the 1929 contest have been altered somewhat over the 1928 contest. This is important as you do not want to be disqualified for not complying with the rules. You should re-read the rules carefully so that you understand thoroughly the new size requirements.

Regarding power driven models using power other than rubber bands, you will note that all machines must have a propeller, even though the rules at the present time include rockets as a possible source of power. There may be some alteration of this at a later date but you should keep this in mind if you expect to build a rocket machine so that you will not be disqualified.

Compressed Air Motors

There are several good compressed air motors being manufactured which you will find fairly satisfactory for this power event. You will find that the smaller the compressed air motor the more efficient it will be, as even a small motor will deliver sufficient power to drive a fairly large machine for a considerable length of time.

The Model Editor personally would like to see every contestant at the National Finals have a compressed air machine which would fly for at least one minute and I venture to say that there will be a larger number of compressed air models present than one might expect offhand because of the recent rapid developments in this line.

Bibliography

Following is a list of additional sources:

BUILDING AND FLYING MODEL AIRCRAFT, by Paul Edward Garber for the Playground and Recreation Association of America, published by Ronald Press, 15 East 26th Street, New York City. *Price* $2.25.

BEGINNING TO FLY, by Merrill Hamburg, published by Houghton Mifflin Co., 386 4th Ave., N.Y.C. *Price* $2.50.

MINIATURE AIRCRAFT FLIERS, by Terrence Vincent, published by the Little LooseLeaf Library, 601 Steele Street, Denver, Colorado. *Price* 40 cents.

JOHNSON'S MODEL AEROPLANES, published by Spon and Chamberlain, 120 Liberty Street, New York City. *Price* $2.00. (Useful for engine driven models.)

EVERY BOY'S BOOK OF HOBBIES, by Cecil Bullivant, published by Thos. Nelson and Co., 381 Fourth Avenue, New York City. *Price* $2.00.

MODEL AIRPLANES, by Elmer L. Allen, published by Frederick A. Stokes Co., 443 Fourth Avenue, New York City. *Price* $3.50.

THINGS WORTH MAKING, by Archibald Williams, published by Thos. Nelson and Co., 381 Fourth Avenue, New York City. *Price* $2.00.

A NEELEY HALL HANDY BOY, published by Lothrap Lee and Shepard Co., 275 Congress Street, Boston, Mass. *Price* $2.50.

CONSTRUCTION OF KITES AND AEROPLANES, published by Manual Arts Press, Third Floor, Duroc Building, Peoria, Illinois.

The following magazines have model aircraft departments or contain helpful information on the subject:

AERO DIGEST, 220 West 42nd Street, New York City.

AIRWAY AGE, 30 Church Street, New York City.

AVIATION, 250 West 57th Street, New York City.

MODEL MAKER, 120 Liberty Street, New York City.

MODEL ENGINEER, 120 Liberty Street, New York City.

POPULAR AVIATION AND AERONAUTICS, 608 S. Dearborn St., Chicago, Illinois.

POPULAR SCIENCE, 242 Fourth Avenue, New York City.

SCIENTIFIC AMERICAN, 24 West 40th Street, New York City.

THE AMERICAN BOY, 550 Lafayette Blvd., Detroit, Michigan.

U. S. AIR SERVICES, Star Building, Washington, D. C.

WESTERN FLYING, 145 S. Spring St., Los Angeles, California.

Sources of Materials

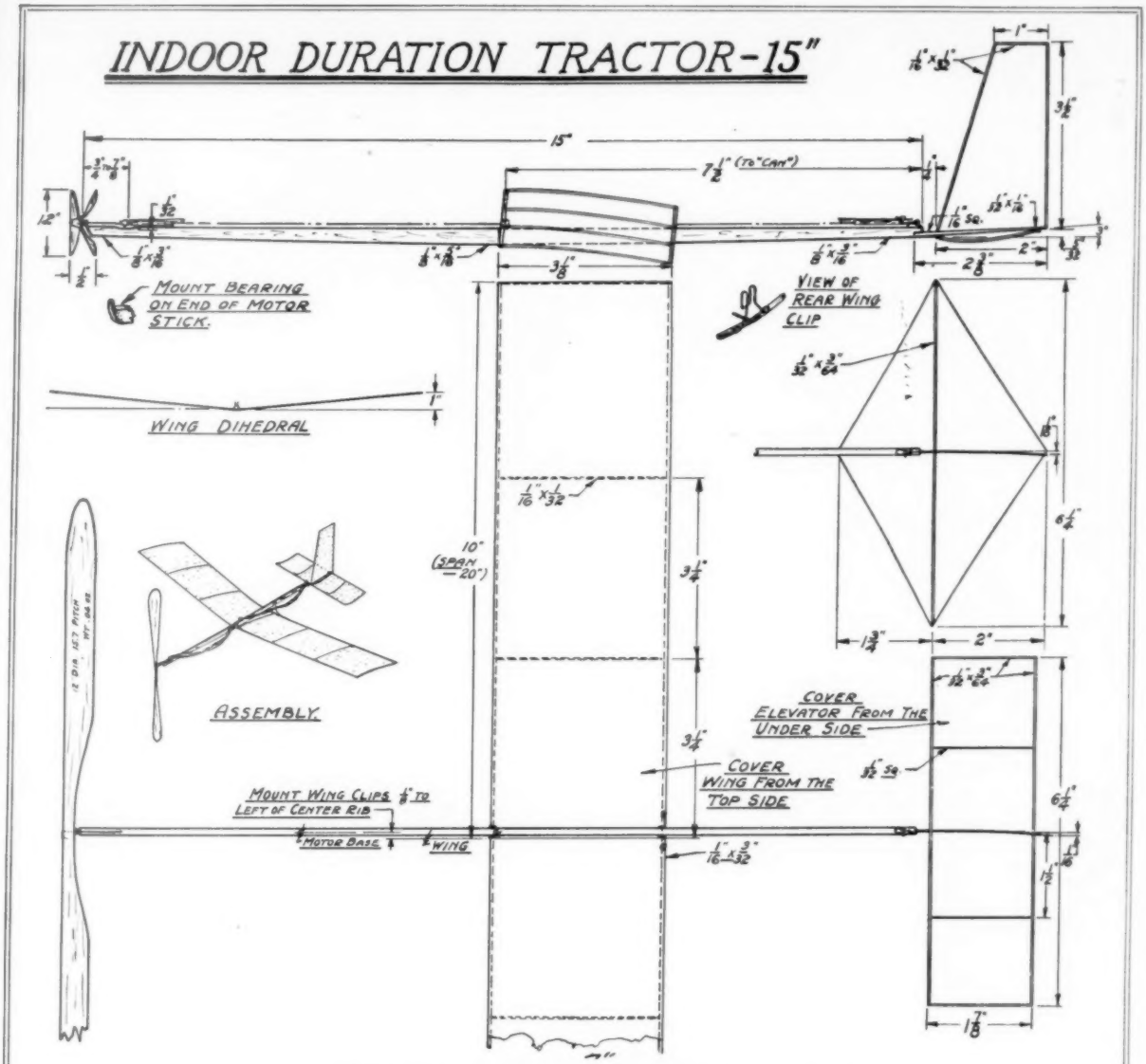
It is suggested that local committees purchase materials in quantity and make it available to boys and girls at cost. The following are suggested sources:

WOOD: *Pine, spruce, bass, etc.:* Local lumber yards.

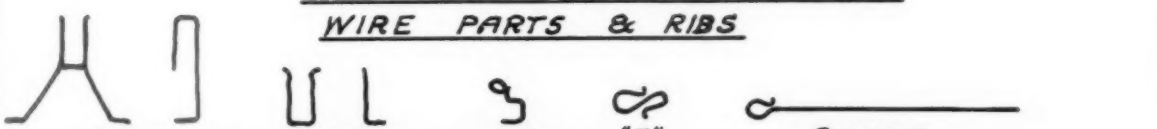
Balsa: The Fleischmann Transportation Co., Balsa Box Dept., 689 Washington Street, New York City.

METAL: *Piano wire, washers, tools, tubing, etc.:* Local stores or James B. Lambie Co., 1415 New York Avenue, Washington, D. C.

INDOOR DURATION TRACTOR-15"



ACTUAL SIZE PATTERNS FOR WIRE PARTS & RIBS



REAR & FRONT WING CLIPS — #8 (.020") RUSTPROOF MUSIC WIRE

REAR HOOK — "S" HOOK — SHAFT

2 TOP SIDE] FRONT

"CAN" #6 (.016) MUS. WIRE

WING RIB PATTERN

7- REQ'D.

ELEVATOR RIB —

5-REQ'D

FABRIC: *China Silk:* Any notion store.
Tissue paper: Local stationery and 10 cent stores.
Bamboo paper: Japanese tissue, paper veneer, etc.: The Japan Paper Co., 109 E. 31st St., N.Y.C.
Rubber Thread: The Easthampton Rubber Thread Co., Easthampton, Mass.—The United States Rubber Co., Thread Division, Boston, Mass.

LIQUID: *Ambroid (cement):* Hardware stores or The Ambroid Co., 227 Miller Avenue, Brooklyn, N. Y.
Dope, (regular airplane dope to be diluted with acetone for model use): Titanine, Inc., Union, Union County, N. J.—Johnson Airplane and Supply Co., Dayton, Ohio.
Acetone: Drug store.
Banana oil: Drug and paint stores.

COMPRESSED AIR MOTORS, PARTS, AND SUPPLIES: Advance Peru Model Airplane Shop, Peru, Ind.

GENERAL: All model parts, fittings, wood, plans, etc.
Aero Model Co., 421 South Clark St., Chicago, Ill.—Advance Peru Model Airplane Shop, Peru, Indiana.—Airplane Model League of America, 550 Lafayette Blvd., Detroit, Mich.—Capitol Model Aero Club, Supply Dept., 1728 "I" St., Washington, D. C.—The Ideal Aeroplane & Supply Co., 22-26 West 19th St., N.Y.C.—U.S. Aircraft Corporation, 341 Monroe St., Brooklyn, N.Y.—Local Department Stores.

Hints for Contests

Send to Playground Assn. for entry blanks.
Secure cooperation of local newspapers.
Provide for local instructors.
Provide sources of material and plans for contestants.
Arrange series of preliminary tournaments.
Set your dates for final elimination contests early enough to permit of postponement if necessary. Plan to hold local finals between August 15th and September 1st.
Under no consideration will records for tournaments held after September 9th be accepted.
Secure proper blanks for submitting records to national committee from Assn. Headquarters.
See that records are mailed to the National committee not later than September 10th—earlier if possible.
Arrange for financing your representatives to Louisville for National finals.
See that all groups interested in model aircraft are included in your plans.
Indoor Duration Tractor—Guide

Indoor Tractor Model

For the indoor contest at the National Playground Tournament and elsewhere, you will want an Indoor Tractor Model. The following record type machine is easy to construct and fulfills all of the requirements and complies with all rules for this event. It embodies the features of cambered wings, inverted cambered tail, and special light weight fuselage; it has no vague mysteries. This is the type of ship that holds the world record for indoor models. If you make your machine exceptionally light and still strong enough, you may add an inch to the length of the model base and rubber without interfering with the excellent flying qualities.

If you make this model longer than the 15 inches specified in the drawing, however, it will be ineligible for the National Playground and Recreation Association contest, but it will not be ineligible for some other contests, where fifteen inches is not the maximum length.

No particular feature of this ship can be credited with the great success of the model. It is the combination of all of the various refinements which make it a "World Beater."

To Prevent Stalling

Because indoor models are so slow in their flight, they quite often stall at the beginning even though the model has the proper adjustment for flying after the rubber has unwound a little. To counteract this stalling tendency to a certain extent, at least to make the model recover much more quickly, the inverted cambered elevator will be found to be a great help. Two types of elevators are shown in the drawing, however; one the completely framed type which Aram Abgarian used in breaking the world's record at the Detroit National contest last year; the other a lighter cambered type which has been used for years by the best builders of indoor models because of its lightness. You can take your choice of these two types and build the one which is easiest for you to construct.

Material List

To build this fine indoor model, you will need the following materials:

1 Balsa motor stick, 1/8"x5/16"x15".
1 Balsa propeller blank 1/2"x1.2"x12".
1 Balsa strip for making wing beams, 1/16"x1/2"x10".
1 Balsa strip for ribs, fins, and elevators, 1/32"x1"63/8".
1 Front bearing, drilled.
1 Propeller shaft.
1 Rear hook.
1 "S" hook.
1 "Can."
1 Set of wing clips.
2 Light weight thrust washers.
1 Rubber motor 32" of 1/8" x 1/32" flat rubber.
1 Sheet of superfine Japanese Tissue, 9"x24".
1 Bottle of Ambroid.
1 Bottle of Banana oil.

It is advisable to use rust proof plated music wire for the wire parts if possible, as this improves the appearance of your model.

With all of these materials gathered together, you need only to understand the following instructions for the construction of this model. So that you know exactly what you are about to do, study the drawings very carefully, as they are the key to many of the points discussed in the description.

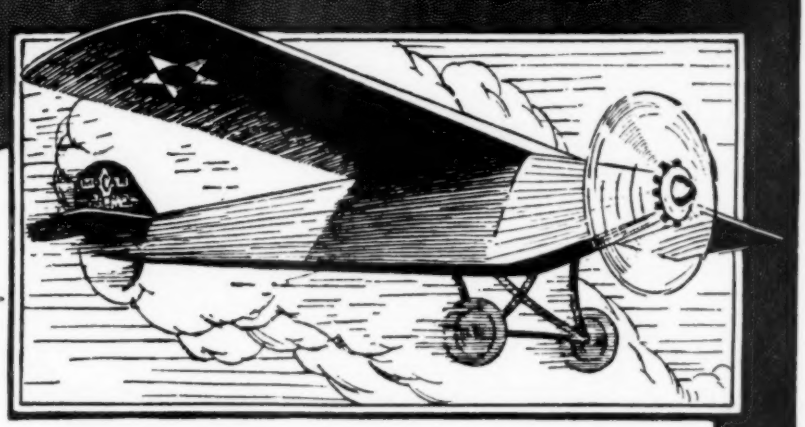
Fuselage

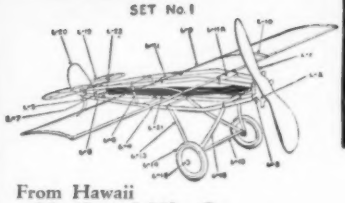
For making the fuselage, you will need to taper the fifteen inch motor stick from 1/8" x 5/16" at the center, to 1/8" x 3/16" at each end. Very slightly sandpaper the outer surfaces and edges of the stick with fine sandpaper, mainly to remove the fuzz and to make the surfaces smooth. If the balsa is tough, the stick can be sanded to 7/64" x 9/32" at the center and 7/64" x 5/32" at the ends. Make a small light weight "can" (if you do not buy a kit with one already included). This can should be made from No. 6 rust proof music wire. It should be mounted on top of the motor base as shown in the drawing. It should be about 5/32" high and 7/32" across. If it is set at a slight angle to the motor base it will be more satisfactory. An open sided can will be found quite desirable. Ambroid this can securely to the center of the motor stick. Shape the bearing so that it fits on the end of the motor stick. Be sure that the drilled hole in the bearing is not more than 3/32" above the surface of the motor base. This is to prevent the rubber from being too high and bending the motor stick, and to prevent it from being too low and rubbing on the motor stick. It might even be advisable to cut out the top of the motor base as shown in the drawing just at the point where the loop in the propeller shaft might otherwise rub. Ambroid the front bearing securely to the stick. Make a rear hook of No. 8 music wire and ambroid it securely to the stick.

The two types of tail surfaces shown in the drawing will both work quite well. However, you will find that if you have never tried to construct one of the rectangular elevators it will be easier for you to make the plain pattern. The Model Editor believes that it would be quite possible to break the present record with a plain pattern elevator. For years in fact, model builders have used cambered elevators of the plain pattern and if you will construct a slight camber in your plain pattern elevator, you will find that it will give you practically the same results as the rectangular, built up elevator with considerably less weight at the tail. The main objection to a "framed" or built up elevator is its weight, which, in combination with the inverted camber, pulls the location of the wing too much to the rear of the model making it very difficult and sensitive to adjust. If you

The MOCAR

MODEL AIRPLANES That FLY





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Sanborn, Iowa.

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JOE E. CUFFEL,
Instr. Manual Arts, Sanborn, Iowa.

The Mt. Carmel Mfg. Co.

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Yours truly,
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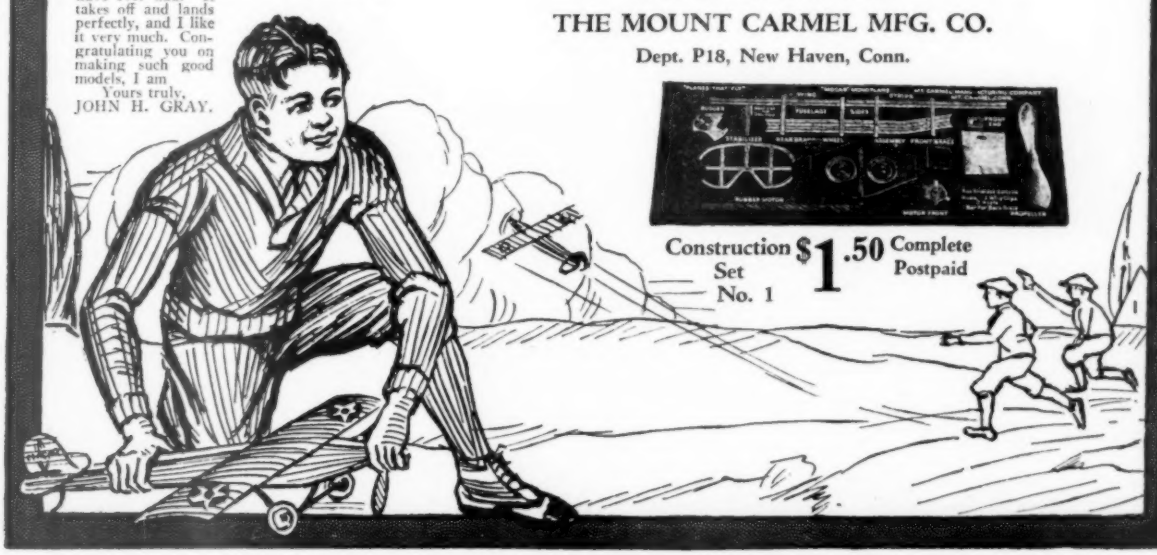

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use superfine tissue and make the tail group extremely light, you will have your wing balance point located as far forward as possible.

Follow the drawings very closely for the style of elevator and fin you select, and you will have no difficulty in completing the fuselage. Note carefully the angles at which the fin and elevator are mounted. Be extremely careful in papering the tail group to get the paper on smoothly. The completed fuselage, papered ready to use, should not weigh over 7 ounces.

No efficient method for making a hollow spar for indoor models has been described to date in any magazine, as the methods described have been too tedious and produce a poor spar without any appreciable saving in weight; so I would advise against attempting to build a hollow spar unless you have developed sufficient workmanship to make one on your own ideas. The Model Editor has seen some very fine hollow spars, but they are hardly worth the trouble in results produced as it usually takes from ten to twenty hours to make a good one.

Wings

You will note that this is an *all balsa* model, and the wing is no exception to the rule. With your marking gauge, or with a ruler and razor blade, slice off four 10″ wing spars, 3/32″ wide from the 1/16″ by 1/2″ x 10″. Make seven ribs, exactly alike, using the actual size pattern in the drawing to obtain the proper curvature or camber. Too much camber is just as bad, or worse than not enough. A 1/8″ camber will be found quite satisfactory. In fact, 1/8″ camber was used on the Model Editor's bamboo wing Indoor Duration Tractor Model which held the record for a number of years, and according to the best information available, 1/8″ camber was used on Mr. Abgarian's present world record model. The high points of the camber should be about 3/10 of the cord back from the entering edge. To bend the camber and the ribs, you will find the use of heat, either in the form of steam or a hot iron or a bamboo bender most convenient. The ribs can be bent in one piece and sliced apart with a razor blade.

Assembling Ribs

No matter how careful you have been there will be some difference in the width of the ribs; there will be some heavier or wider than the others. Therefore, select the three heaviest ribs for the center and the two wing tips. Assemble the wings in halves one right and one left hand, on an actual size drawing or layout, which you should make on a piece of cardboard, in case you do not buy a kit with full size blueprints. Hold the parts in place by weights, pins, or other convenient means, leaving out the center rib. Drop small drops of ambroid on the butt joints, but be careful not to use too much as it will run through and stick the parts to your pattern. Be sure you wait until the ambroid is thoroughly dry before moving the wing halves.

Joining Wing Halves

Now comes one of the most important parts of the model—joining the wing halves! If you join the wing halves at too great an angle, or dihedral, to each other the center of thrust or pull of your propeller will be too much below the center of drag or resistance of your wing, and your machine will stall badly at the beginning and dive rapidly at the end of the flight. If you do not have sufficient angle or dihedral in your wing, the model will not have very much stability and it will tend to side slip on one wing tip or the other. See the drawing for the exact amount of angle or height to block up the wing tips in cementing the spars together at the center. Carefully put two coats of ambroid on the top of the center spar joint allowing the first coat to dry before applying the second coat. When the second coat of ambroid is thoroughly dry, carefully remove the wing from the blocks and put a block of equal weight at the center. Now ambroid the bottom of the joints with several coats of ambroid. Be sure that both front and rear spars are parallel to each other and have the same dihedral angle. Make two wing clips as shown in the drawing from rust proof music wire. Be sure that you get the proper height especially on the rear wing clip as the lift of the wing depends upon the height of these clips. It should hold the rear wing beam 5/16″ away from the bottom of the motor base. If you do not get the elevator angle exact, you may find that to obtain proper stability the height of this clip should be as much as 3/8″. Mount these wing clips securely to the wing beams 1/8″ off center to the left so that the wing will be held at exactly right angles to the motor stick. Setting the clips off center makes the right wing 1/4″ longer than the left making "countertorque" incidence unnecessary. Be sure that these clips fit the motor base snugly without squeezing or damaging the motor stick and not so loosely that the wing will come off in flight. Remember in attaching the wing clips that the tall wing clip fastens to the rear of the wing, and that the short one goes to the front of the wing which you will remember is the edge closest to the high point of the camber of the ribs.

Wing Covering

For covering the wing, carefully trim a piece of superfine Japanese tissue to a size somewhat larger than half of the wing. A piece 3 1/2″ x 10 1/4″ is about the right size to use. A larger piece would make the covering operation more bothersome. To cover a cambered wing it is necessary to be very careful so that you do not cause the paper to sag between ribs. In fact, if the paper is very much wrinkled, you should first iron it out with a hot iron on a piece of smooth paper.

Wing Covering

It is suggested that you do not use freshly ironed paper right away. Give it time to pick up moisture from the air and resume its normal size again. As you know, paper shrinks considerably when it is hot and dry. If you cover the model with the warm, dry paper you will find that it will soon sag and spoil the efficiency and appearance of the surfaces. First stick the paper slightly to the center rib using banana oil or paper cement. Do not use ambroid to cement the paper as it is too heavy. Of course you should trim the paper so that it fits around the wing clips neatly. When the paper has stuck to the first rib securely, you can proceed to stick the paper out to the next rib. Be careful that you do not stretch the paper so tightly between ribs that it curves the wing spars and pulls the paper down, thus destroying the cambered effect. Proceed by papering one rib section at a time until the whole wing is surfaced. Then very carefully trim off the margin with a razor blade or by using fine sandpaper. You will note, of course, that the paper is stuck on top of the spars and ribs. The upper surface of the wing especially at the front, is the most efficient part of the wing curve and should be as smooth as possible. If you do not succeed in covering the wing smoothly enough at first it will probably pay you to try it over again, taking heed of the experience gained in your first attempt.

After all, the wing was quite simple, was it not? The hardest parts of your model are now completed. If you have done a good job on your wing, you will find by weighing it on your scales made according to the instructions published in the January 1929 issue of Popular Aviation and Aeronautics that it will weigh about .05 to .06 ounces.

The Propeller

You will find in carving the propeller for your Indoor Duration Model that an article printed in the November issue of Popular Aviation and Aeronautics, entitled "How to make Propellers" will be a great help to you. However, the following brief description should enable you to carve a satisfactory propeller.

First, draw diagonal lines on the two larger flat faces of the blank from exact corner to corner. Then, measure from each end of the blank and locate the center exactly. You should locate the center by measuring from the ends, since the

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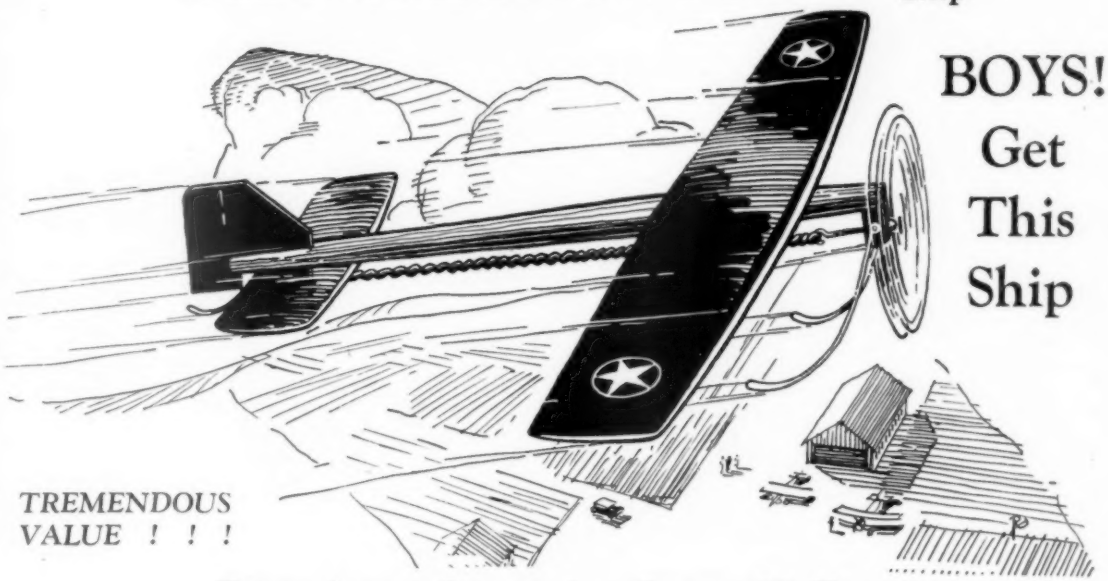

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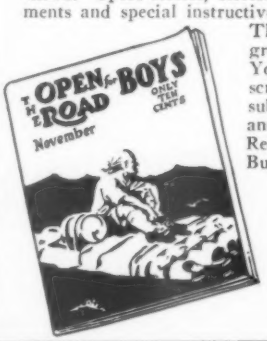

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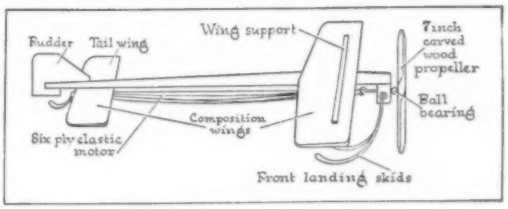

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slightest inaccuracy in drawing the diagonal lines will cause the center to be considerably inaccurate if you take the intersection of these diagonal lines for the center rather than measuring equal distances from the ends. Leave about ⅛″ width at the hub and cut out the Balsa wood from the sides of the blank, leaving the two long triangular shaped ends with their apexes joining the hub at the center. If you have done this work accurately and carefully, you are now ready to proceed with carving your propeller. To make a right-handed propeller, so that the propeller will rotate counter clockwise as you look at the model from the front, you will have to carve away the upper right-hand edge of each half of the blank on both sides. If you hold the cut-out propeller blank in your left hand and cut on the end away from you so as to carve away the upper right-hand edges, you will be making a right-handed propeller.

This is the easiest and most natural way to carve a propeller; so you will not be bothered with this point.

Be very careful in carving so that you do not carve away the straight edges of the blank which serve as guide lines to make the propeller true pitch. Carve the blades down as thin as you can, using a good sharp knife. The blades should not be much over 1/16″ thick when you are ready to start sanding.

Propeller Finishing

Remember that you do not round the tip of the propeller blades until the very last operation. First, with coarse sandpaper, and then with fine sandpaper, you should sand the blades down so that they are a 32nd of an inch thick and so that the bottom side, or the side you intend to be nearest the model is flat, or very nearly so; and so that the top side or front side of the propeller blades is slightly rounded. The propeller should be balanced approximately at this stage by balancing it on your knife blade and by sanding off the heavy end until it balances approximately at the center. You are now ready to round off the tips and cut out the hub. Do not round the tips very much. For convenience, you will find that a quarter or fifty-cent piece will help you to round both propeller tips alike.

Cut down the hub from the back side (see drawing) so that it is about 3/16″ deep. The cut out spaces on the back of the hub should be equidistant from the center. About two inches on each side of the center will be found satisfactory. With your fine sandpaper, carefully round the thick edges where you have cut out the hub and rounded the tips. Install the shaft by carefully piercing it through the hub. Then bend a "U" in the end of it and pull the point of the "U" back into the hub. After carefully aligning the shaft by sighting to see that it is straight in the propeller, ambroid it in place with a drop of ambroid on each side of the hub. Slip the two small washers on the propeller shaft and if the propeller is carefully balanced your final job is completed. The completed propeller should weigh about .04 ounces.

The Motor

Tie a knot in the rubber motor using a piece of ⅛″ x 1/32″ flat rubber. The complete motor should be in the form of a loop about 15″ long weighing about .06 ounces. Make an "S" hook of No. 8 rust proof music wire to the actual size shown in the drawing, and slip the "S" hook on to the rubber motor right at the knot. This is important as it puts the knot at the rear of the machine where it will not rub on the motor base and interfere with the flying of the model. The rubber motor will stand 1000 to 1500 turns depending upon the condition and size of the rubber as well as on the speed of winding and initial stretch at the beginning of winding.

Trial Flights

For a trial flight, slip the wing on to the motor base with the front wing beam even with the center can, as this gives you the approximate wing position. If the model stalls the wing should be moved back slightly, or if the model noses down slightly the wing should be moved forward. ⅛″ makes a considerable difference in the wing adjustment. When the proper position of the wing has been found mark the motor base so that you can always slip the wing on in the proper position.

You will note that because the wing clips have been mounted slightly off center, you will probably need no correction for torque. However, if the inside wing flies low, and the model slips to the ground it may be necessary to warp the wing slightly so that the right end wing tip, when viewed from the front, has a slightly greater angle of incidence. However, if the model flies sideways like a crab with the outside wing tip low, the inside wing probably has too much incidence and you should remove some of this. Of course, the fin or rudder must be set at the right angle for the size of the circle desired or the model will be thrown into a side slip one way or the other. These are matters of minor adjustment which the model editor will leave you the pleasure of straightening out for yourself. If you have made a good model you should have no trouble in making at least two minutes duration and with a little practice you should be able to make three and four minutes and possibly even break the world's record; as the last minute or two depend as much on the model flyer and the adjustment of the model as they do on the design of the ship.

Let us go now and see who can break the present record by the greatest number of seconds.

Weights Table

Fuselage	.07
Wing	.05-.06
Propeller	.04
Motor	.06
Total	.22 oz. to .23 oz.

Indoor Contests

Continued from April

For indoor events the judges should keep everyone out of the area in which official flights are being taken. They should also stop trial flights temporarily if the model on an official flight should happen to circle over into the area allotted for trial flights. The slightest disturbance of air caused by people walking around on the floor unnecessarily might cause a crash at the beginning of the flight or cause the model to swoop down several seconds prematurely at the end of its flight. For any official flight all three judges should time the model as accurately as possible. They should be instructed in the use of the stop watch before the contest in case there is any doubt in their minds. The operations of different makes of stop watches are sometimes confusing even to one experienced in the matter. Average the times recorded on the three stop watches. These should be within a few tenths of a second of each other. Carefully record this time after the correct contestant's name on the record. The judges should use discretion in a case where a model strikes an object while in flight, as the model may continue its flight or may become caught upon the obstruction. One judge should be specifically instructed to allow his watch to continue in any such case so that if the model should become detached from the obstruction almost instantly the model flyer can be given credit for the flight. If the model comes to a complete rest and is knocked off only by the remaining power in the rubber motors after several seconds, the flight should be considered terminated. However, if the model just lies or catches or strikes on the obstruction and immediately rebounds or slips off, it is plain that in all fairness to the contestant, since the flight was practically continuous, the time should be allowed.

However, do not confuse this with a model which strikes the floor and then rises again to climb and fly for additional duration. The minute the model strikes the floor the flight should be considered terminated. Of course, the rule which

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gives the contestant a penalty of only one-third of an official flight if the model strikes the floor or lands upon an obstruction within 10 or 15 seconds of launching—whatever the minimum official flight rule for the event happens to be—will protect him somewhat against the possible loss of a full official flight. For indoor rise-off-ground events (or rise-off-floor, if you wish) see that the models rest on the floor at three points. The three points are the two wheels and the tail. Also it is suggested that a penalty of one-third of an official flight be given any contestant who pushes his model at the start of such a flight either R. O. G. or hydro. This is important, as at a recent national contest one of the trophy cup winners would place his model on the water in the indoor hydro event and then lift it off the water as much as 1 or 2 inches and launch it from this height above the water, thus really making a hand launched flight rather than a hydro flight. The flight should be disqualified and counted as foul and the contestant should lose one official flight.

For indoor and outdoor weight carrying events you should have an accurate scale which will weight to 1/100 of an ounce or closer if possible. The winner is decided by determining the one which carries the greatest weight ratio. This weight ratio is the ratio of the cargo weight carried to the complete flying weight of the machine without the cargo weight. One person who is experienced with the use of the scales should do all of the weighing in the presence of the other judges of the group, as several persons might operate the scales slightly differently and cause an unfair result for the contestants.

Outdoor Contests

The most fair and satisfactory method of timing outdoor contests is for the judges to follow the models in flight in an automobile accompanied by the contestant. This should be done wherever possible, as on numerous occasions at national contests models have been lost because the judges were unable to follow the model. An incident at the Memphis contest shows the advisability of this procedure. Little Jack Lefker won the Junior duration event with a flight of over 5 minutes and 37 seconds. His model flew outside of the boundaries of the flying area and landed several blocks beyond in a thickly built-up section of the city. Because the model was being followed by the judges in a police automobile they were able to be at the place where the model landed, get the exact time of the model and save the model from any possible damage by pedestrians or children playing in the neighborhood.

A reverse of this situation occurred at Detroit when Mr. Joseph Lucas and other "long distance runners" from the Illinois Model Aero Club timed his model at well over 11 minutes. However, his official time as allowed by the judges was only 4 minutes and 24 seconds because the judges did not follow the model and see it land. As it was, the boys from the famous Chicago club had to solicit the aid of a government pilot and plane (a Curtiss Hawk) from Selfridge Field to locate the model, as it landed across the river in some tall grass. Had the model been followed across the field in an automobile or even with a motorcycle side-car, Mr. Lucas would have been officially credited with breaking the world's record as well as winning the contest with a more favorable margin of time which his model flight justly merited.

In outdoor events, care must be taken that the next contestant in line in the group should not wind up his model too far ahead of time, as having to wait with the rubbers fully wound is liable to cause them to go partly dead and partially spoil his chances. He should not be per-

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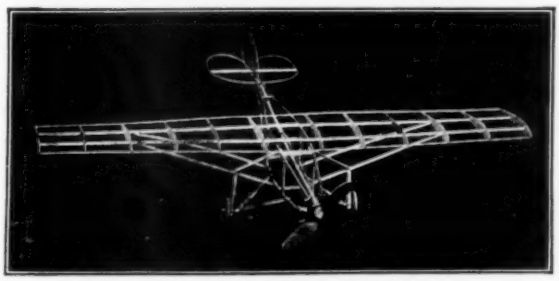

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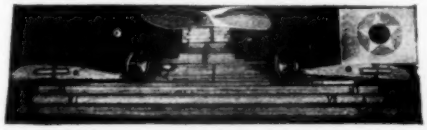

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mitted to wind up until it is obvious that the flight ahead of him is about to be terminated.

In case there is only a very gentle breeze blowing it is possible to conduct the contest satisfactorily on the relay system. That is, each flight is followed as rapidly as possible on foot by one official and the model flyer. The official should be provided with a flag with which to signal the three judges at the starting point when the model lands. Sometimes an intermediate flagman is used to relay the time of finish to "headquarters." The flag should not be displayed until just before the model is about to land. Then it should be held up in the air to indicate this fact to the judges. Just as the model lands the flag should be waved violently back and forth so that the judges may stop their watches at the exact instant the machine touches the ground. The flag should be of a generous size and of a highly visible color combination to make it easily seen for a considerable distance. In case a model flies over a small knoll or behind some obstruction, either the flagman should be instructed to remain in view of the judges or the judges should follow the flagman so as to keep him in their sight. This should be done in fairness to all contestants, for otherwise you will handicap the potential winners and best flyers in the contest. You may find it advisable to relieve the flagman after he has made a number of long chases, especially on a hot day, as it is very fatiguing to run a half a mile or more eight or ten times in the short space of one hour.

Prize Selections

Care should be taken in selecting the prizes for a contest. Prizes of model parts, subscriptions to aviation magazines, and books on model airplanes make ideal prizes for contestants. Tickets for airplane sight-seeing flights are often given. Of course, trophies, cups, medals, ribbons and certificates of merit are always well received by the winning contestants.

Care should be observed in giving cash prizes, as some organizations object to this practice, as they claim it makes the contestant accepting such prizes professional.

All models should be carefully checked before the contestants are allowed to compete. Most contests have requirements such as certain sizes to which the models are limited. At none of the national contests to date has this been done to the knowledge of the author. Size specifications are usually included in the rules but not checked at the contest. This should be done by all means.

The other qualifications of the contestants, such as age, eligibility and building of the model completely by the model

entrant should be carefully attended to by the judges.

There were rules for model airplane contests years ago. The Aero Science Club of New York, the Capitol Model Airplane Club of Washington, D. C., the Pacific Model Club in California and the Illinois Model Aero Club of Chicago worked up much airplane enthusiasm and conducted numerous contests. The only surviving member of this group is the Illinois Model Aero Club of Chicago, which because of the perseverance of some of its older members was able to pull through the war days.

As a result of this, when it was desired to formulate rules for the Mulvihill Outdoor Duration Contest at the National Air Races in 1923, members of the Illinois Model Aero Club were solicited to help in the project. Three members of the club were chosen, Mr. Paul Shifler-Smith, Mr. Edward Lange and Mr. Bertram Pond. These three members of the model club flew to St. Louis in the spacious cabin of Mr. Charles Dickinson's French Breguet biplane, piloted by Buck Weaver, with Henry Tiecotter as mechanic.

In collaboration with officials of the National Aeronautic Association and in the light of their years of experience in conducting model airplane contests, the following basic sets of rules were drawn up.

Rules for the St. Louis 1923 Air Race Mulvihill Model Trophy Contest

1. "The trophy shall be perpetual and competed for annually by members of the Junior Flying League of the National Aeronautic Association, using hand-launched model airplanes, driven by rubber strand motors.

2. "The contest shall be in the nature of a duration race, and shall be conducted under rules governing such a race, as may be prepared from time to time by the Contest Committee Board of Governors, which shall have the privilege of conducting each annual contest for the Mulvihill Model Trophy or of assigning this privilege, under sanction, to any other organization.

3. "The trophy shall be awarded each year to the club, body or chapter represented by the entrant of the winning model, and this body shall be entitled to the possession of the trophy until one month prior to the next succeeding contest, at which time the trophy shall be returned to the National Aeronautic Association; suitable bond for its proper care and return shall be required by the

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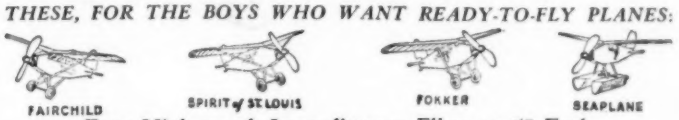

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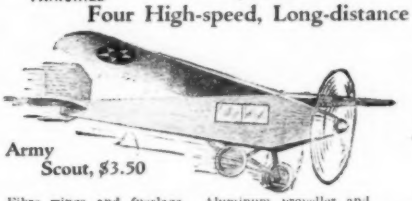

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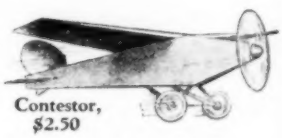

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donee from each and every person or organization into whose possession the trophy shall at any time be delivered.

Conditions of Contest: No restrictions on the design of the models except that they shall have a wing span of not to exceed 40 inches. All models must be hand launched and the only motive power will be that derived from the use of rubber strands.

Character of Contest: The race shall be for duration. A contestant may be allowed three trials and will be accredited with the greatest time made in any one of the three trials.

Number of Entries Per Contestant: No contestant will be allowed to enter more than three models.

Method of Starting: All contestants must have their models and be on the starting line at 2 p. m. The first signal will be given at 2:15, at which time the contestants will wind up their motors. The starting signal for the first model will be given at 2:20, at which time the first contestant in line for start will release his model. The starting signal for the release of the second model will be given thirty seconds after the first model has been released. Each additional model will be released at intervals of thirty seconds. No contestant may receive a second start until all models have been released. Each contestant will be allowed two additional starts, which he may take in turn after requesting such privilege from the Chief Starter.

The Finish: The finishing time will be taken when the model first touches the ground after being launched.

Winner: The winner of first place shall be the owner and builder of the model which has remained in flight for the longest elapsed time, and of second place the second longest elapsed time, etc., providing the contestant has not been disqualified.

Qualifications: No contestant may take part in the contest for this trophy unless he is a member of the Junior Flying League of the National Aeronautic Association, and in good standing. He must also be the owner and builder of the model submitted; however, the design for the model may be obtained from other sources than his own. He shall be the builder of the entire model with the following exceptions: Propellers, motor bearings and propeller shaft; also such other small metal fittings as may be used in the construction of the model may be purchased from outside sources.

Disqualifications: Any contestant breaking the rules of the race, or subsequent ones which may be sent out in writing, shall, upon recommendation of the judges, be disqualified. Models broken upon landing will not be disqualified.

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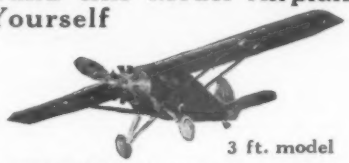

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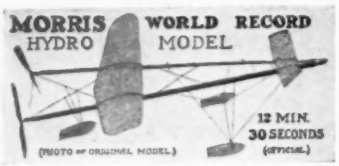

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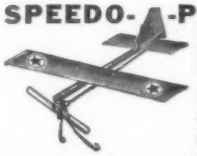

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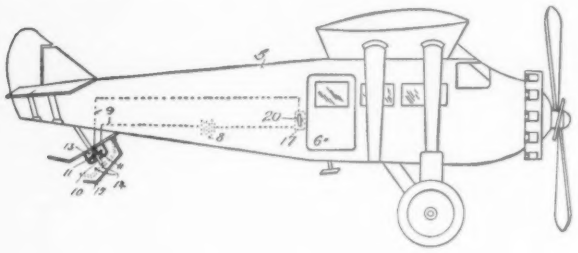
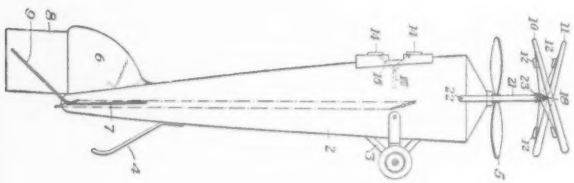
Patent Department

No. 1,701,491, Door Locking Equipment for Cabin Type Aircraft, Patented February 12, 1929, by Frank E. Casey, of Chicago, Illinois, Assignor to National Pneumatic Company, of New York, N. Y., a Corporation of West Virginia.



When the aircraft arises from the ground, its cabin door is automatically locked closed, but when the ground is reached again, the door lock is released. A battery supplies current for the operation and control of the lock.

No. 1,702,109, Flying Machine, Patented February 12, 1929, by Walter T. Davis, of Wheeling, West Virginia.



The wings of this plane are so pivoted that they normally assume their ordinary position but in the event of damage to the machine, stalling of the motor or improper manipulation of the controls, the aeroplane starts to fall, the operator releases a hand lever to throw the wings into a position wherein they act as a propeller. The operator may thereupon release the hand lever 16 to permit the springs 19 to throw the wings into such position that they may operate as a propeller.

No. 1,702,184, Control Gear for Aircraft, Patented February 12, 1929, by Cyril Frank Uwins, of Clifton, Bristol, England, Assignor to the Bristol Aeroplane Company Limited, of Bristol, England, a British Company.

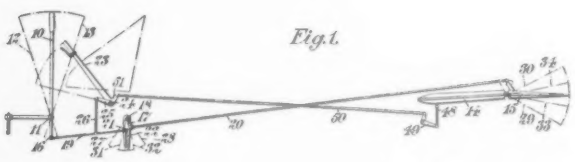
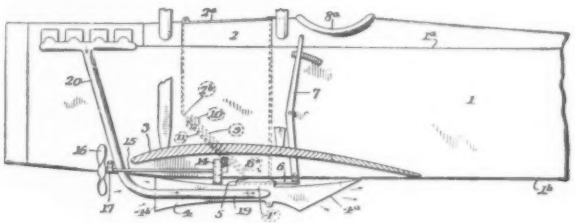


Fig. 1.

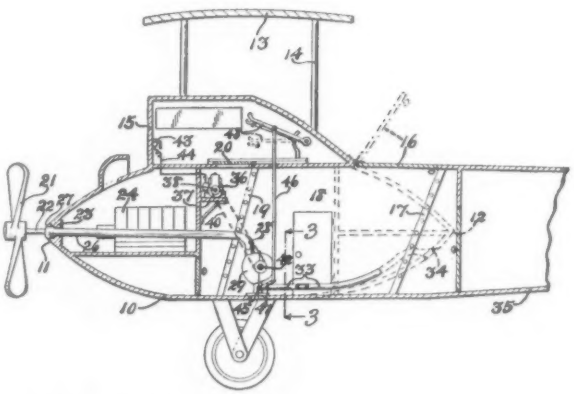
According to this invention there is provided in or for an aircraft, the combination with an adjustable aerofoil (for example the elevator or ailerons) and the means for controlling it (for example the control-column), of means for varying the velocity ratio of the mechanism operatively connecting them. With such a construction the pilot can adjust the controlling mechanism so that when travelling at low speeds a given movement of the control-column produces a movement of the aerofoil suitable to that speed, or alternatively, when travelling at high speeds the same movement of the control-column produces a much less movement of the control surfaces, which lesser movement is appropriate, at the high speed.

No. 1,703,308, Airplane Powder Dusting Apparatus, Patented February 26, 1929, by Elmer Johnson, of Washington, District of Columbia, dedicated, by Assignments, to the Government and the People of the United States.



The principal object of this invention is to provide pneumatically operated powder dusting equipment for dusting by airplane uniformly and at any desired rate. Another object is to make use of the air current produced by the forward speed of the airplane and the airplane propeller to actuate means for agitating the powder in the hopper and to facilitate the discharge of powder from the hopper. This application for patent is made under an Act of Congress of May 3, 1883, and the invention may be used by any person in the United States without payment of any royalty to the patentee.

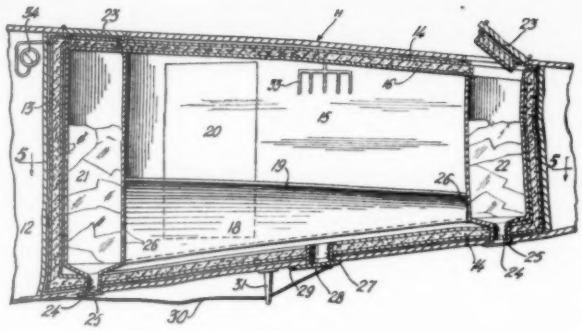
No. 1,703,396, Aeroplane, Patented February 26, 1929, by Elias A. Kauffman, of Chicago, Illinois.



The main object of this invention is to provide the aeroplane with tubular blower mechanism to be selectively controlled for either aiding the usual propellers in the forward propulsion of the aeroplane, or to be rendered effective in buoying the aeroplane and to prevent any rapid or accidental dropping and to prevent its too rapid or accidental descent.

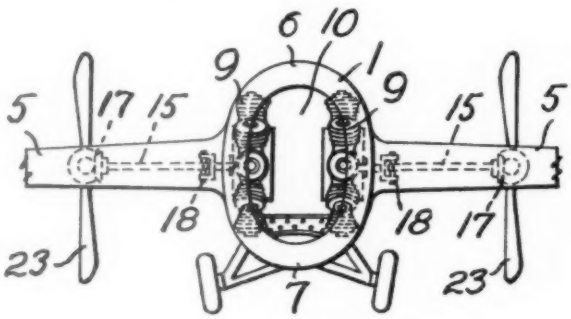
No. 1,702,194, Aircraft Refrigerator, Patented February 12, 1929, by George F. Bosch, of Mount Vernon, New York.

XUM



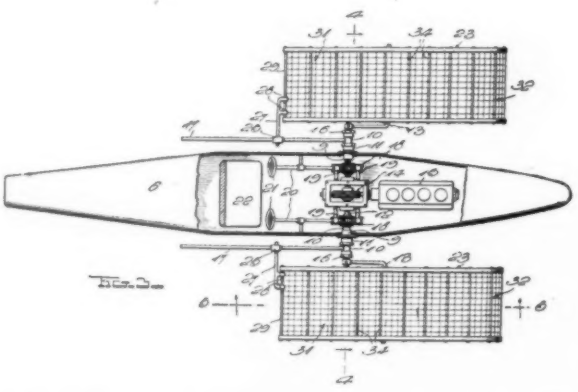
The primary object of the invention resides in a refrigerator built into the fuselage of an airplane for the rapid transportation of fresh edibles, furs, and the like, for preserving them during flight from one distant point to another, thus bringing the markets for such articles into closer touch with the sources of production. A valve permits drainage of the excess water formed when the ice melts.

No. 1,702,306, AIRPLANE, Patented February 19, 1929, by Robert V. Morse, of Ithaca, New York.



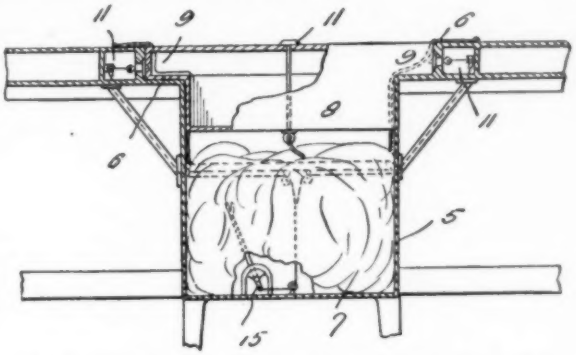
More than one motor is used in this aeroplane construction and the motors are so placed that they are readily accessible for inspection during flight, and are placed near the center of gravity.

No. 1,702,343, COMBINED AIR AND WATER CRAFT, Patented February 19, 1929, by John Griffin, of White Plains, New York.



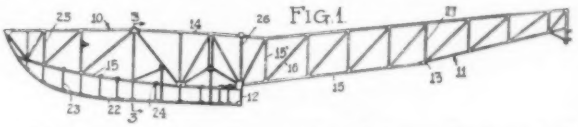
It is the principal object of the invention to provide a craft which embodies propelling ascending and descending means to act against either air or water to propel the ship, the propelling ascending and descending means embodying weight-sustaining means for the craft when the latter is used in the air.

No. 1,702,422, PARACHUTE EQUIPMENT FOR AEROPLANES, Patented February 19, 1929, by Stephen F. Stevens, of Rumson, New Jersey.



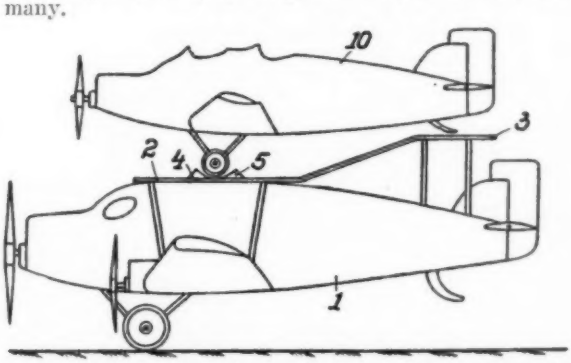
This invention relates to parachute equipment for aeroplanes, and aims to provide a plane construction wherein the body or fuselage thereof is formed or equipped with a parachute receiving pocket open at its upper end and within which is normally mounted a gas filled closure for the pocket, which closure member is attached to the parachute body and normally locked in position within the pocket.

No. 1,702,533, FLYING BOAT HULL, Patented February 19, 1929, by Daniel J. Brimm, Jr., of West Hempstead, New York, Assignor to Ireland Aircraft Incorporated, a Corporation of New York.



The present invention contemplates a float or hull skeleton in which all of the principal, longitudinal, transverse, and diagonal members of the frame, are formed of commercially procurable tubular steel of closed hollow section throughout; in which all of said frame members are welded at their points of intersection; and in which the outer skin is directly fastened to the hull frame by suitable clips riveted or otherwise fastened to the skin and extending on the inside thereof around the tubular frame members constituting the skeleton frame.

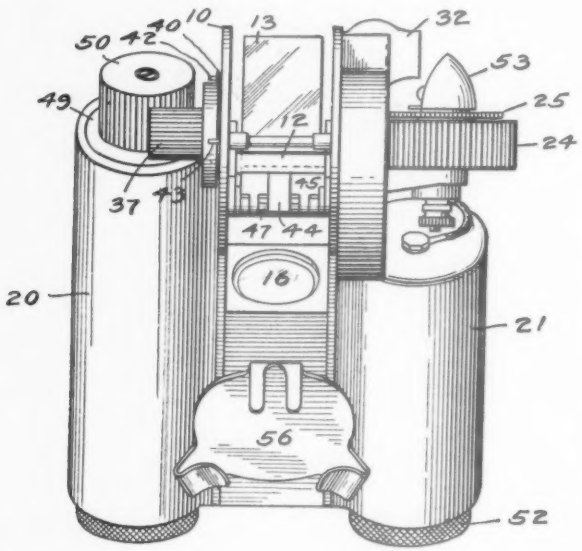
No. 1,703,488, START OF FLYING MACHINES, Patented February 26, 1929, by Hugo Junkers, of Dessau, Germany.



The method of starting a flying machine having the usual landing gear but which is incapable of rising by its own power from the surface when heavily loaded,

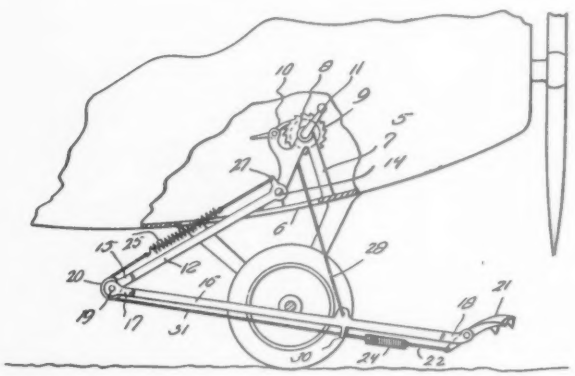
comprising combining such machine with an auxiliary flying machine, utilizing the combined power of both machines for attaining sufficient speed for lifting the machine to be started off the surface and to an altitude at which it is supported by the air to the extent of being able to soar and fly, and then separating the auxiliary flying machine, while continuing the flight of the started flying machine independently.

No. 1,703,705, MEANS FOR DETERMINING ALTITUDE, Patented February 26, 1929, by Karl H. Beij, of Washington, District of Columbia.



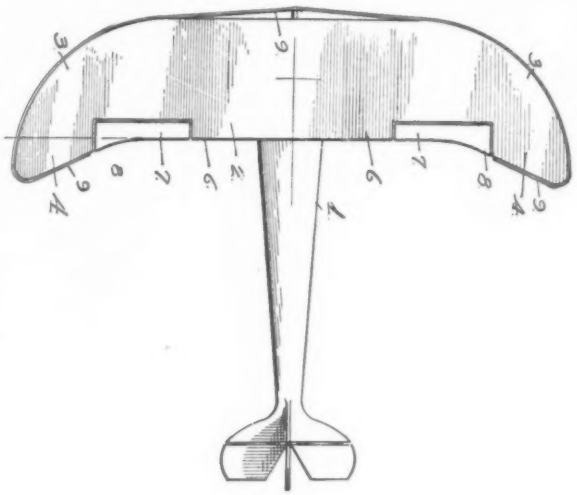
An object of this invention is to provide a sextant of the bubble type in which the sun glasses and index mirror may be adjusted without releasing hold of the handgrips of the instrument and containing means for illuminating the index mirror registering device.

No. 1,702,682, AUTOMATIC GROUND RELEASE FOR AEROPLANES, Patented February 19, 1929, by Charles D. Carey, of Channing, Michigan.



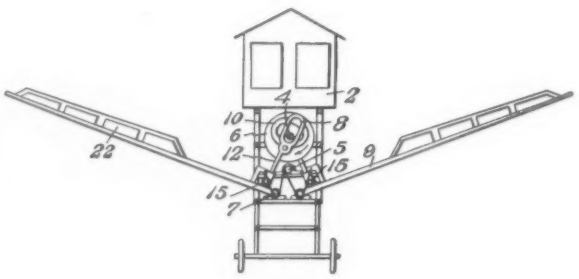
The present invention relates to an automatic ground release for aeroplanes and has for its prime object to provide a structure for lifting an aeroplane upwardly from the ground and urging the same forwardly to permit the same to get off quickly. When the mechanism is released the arms swing into alignment with each other.

No. 1,702,634, AEROPLANE, Patented February 19, 1929, by Cæsar Gida and Leo Jacopi, of Colma, California.



The patentees point out that the outer front corners of the wings are rounded to decrease forward resistance of said planes and the lifting area thus removed is regained by forming rearwardly extending portions on the outer rear corners of the planes, such portions extending rearwardly beyond the rear edge of the main body of the wing or plane, forming means, without increase in the weight of the wing, for increasing the longitudinal stability of the aeroplane. The usual ailerons are provided with their outer ends forming a part of the rearward extensions in order that said ailerons may have a greater lateral stabilizing effect and at the same time, by reason of their rearwardly projected portions, tend to increase and assist in longitudinal stabilization.

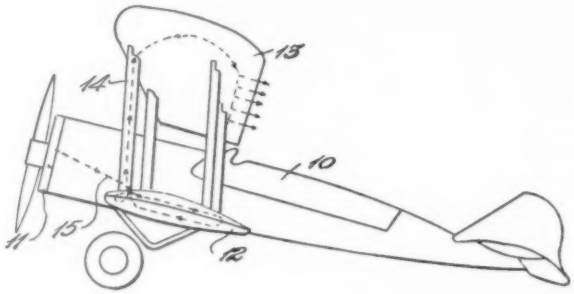
No. 702,645, STEERAGE OF WINGED AIRCRAFT, Patented February 19, 1929, by Adolf Ehrlich, of Budapest, Hungary.



According to the present invention the pilot of the floating aircraft is capable of giving the supporting surfaces, both wing shafts remaining in a common horizontal plane, i.e., without troubling the stability of the aircraft, any required inclination, and that forwardly as well as backwardly, and set them too, parallel to the direction of the flight. The backwards sloping swinging wing renders the use of any propeller dispensable whereby also the part of the motor force producing the air whirls will be spared and the noise caused by said whirls eliminated.

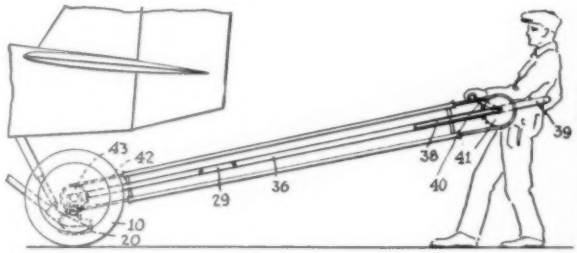
XUM

No. 1,703,612, AIRCRAFT HEATER, Patented February 26, 1929, by Aristides S. Carousso, of Flushing, New York.



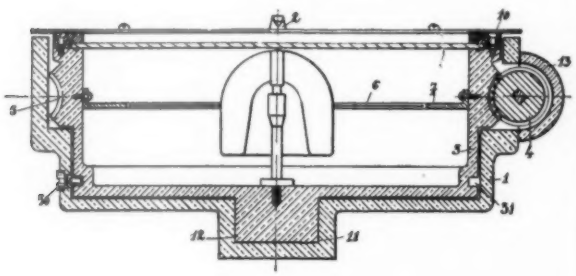
The principal object of the present invention is to provide an improved construction of airship wherein the heat of the engine exhaust is utilized to maintain the outer covering of the ship, especially the wings in aeroplanes, in a heated condition so that ice, sleet and snow will melt as fast as they form or fall on the ship and thus not only prevent the addition of weight but also prevent the distortion of the lift surfaces or other form of the ship.

No. 1,703,652, AEROPLANE DOLLY, Patented February 26, 1929, by Luis Azarraga, of Hempstead, New York.



An object of the invention is to provide a one man aeroplane dolly, i. e., an aeroplane dolly in which provision is made for raising the aeroplane, for supporting it when raised, and for transporting it from place to place; the operations, in each instance, being accomplished single handed. The rear portion of the device slips about the operator's waist.

No. 1,701,034, COMPASS FOR AIRCRAFT, Patented February 5, 1929, by Pierre Escallier, of Lyon, France.



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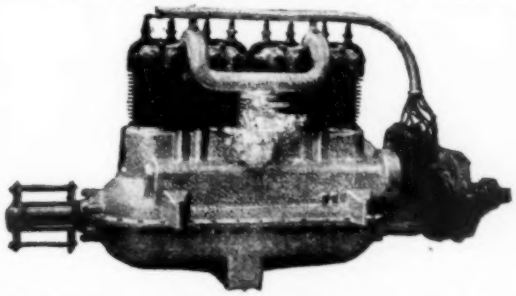

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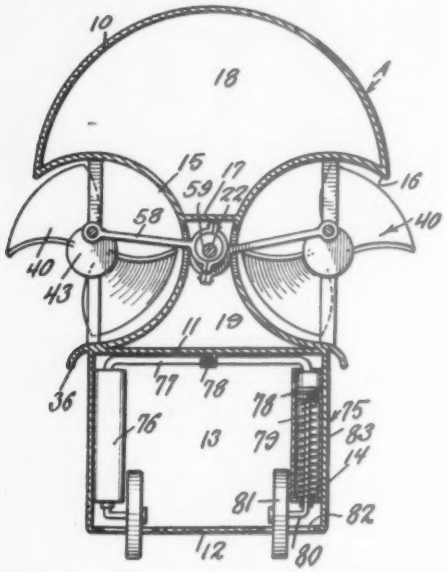
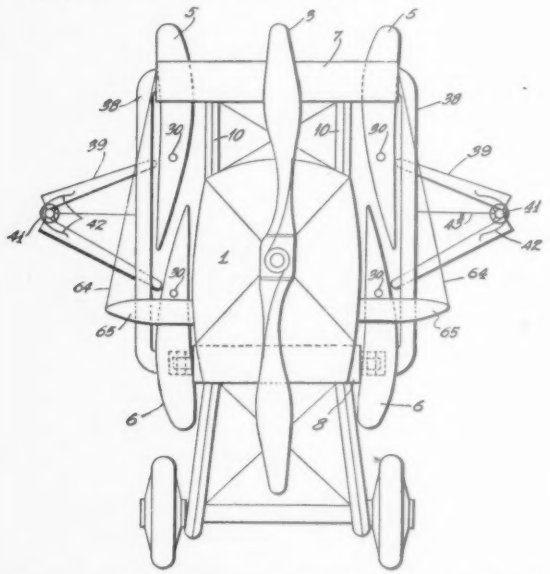
bowl, a compass card mounted within said crown, and a representation of the body of an airplane depicted on the card and having its corresponding nose, wing tips and tail positioned on said crown, whereby the parts of the representation are in alignment when the aircraft is on the proper course.

No. 1,701,116, AIRSHIP, Patented February 5, 1929, by Otto Karl Quast, of Spokane, Washington.



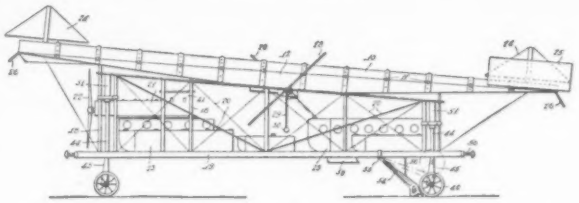
It is claimed that this invention embodies advantages of both lighter and heavier than air machines, and provides longitudinally extending air channels formed in the opposite sides of the airship, with a compartment above for lighter-than-air gas.

No. 1,701,298, AEROPLANE, Patented February 5, 1929, by John Dill, of New York, N. Y.



Features of this construction include means whereby the angle of incidence of the wings may be altered and adjusted to suit particular conditions and whereby the wings may be folded by an occupant of the plane without leaving the fuselage. A propeller of adjustable pitch is also provided.

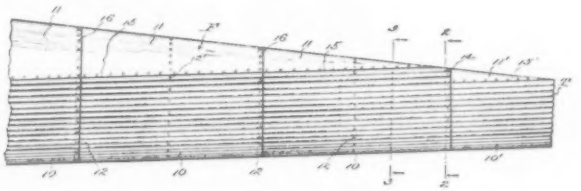
No. 1,701,407, AIRCRAFT, Patented February 5, 1929, by Rogelio Garcia, of New York, N. Y.



One of the principal objects of the present invention resides in the provision of an improved shock absorbing means for use in connection with aircraft which lands by vertical descent, the means serving to relieve the craft of undue shock and vibration, particularly when the same is landed in an emergency.

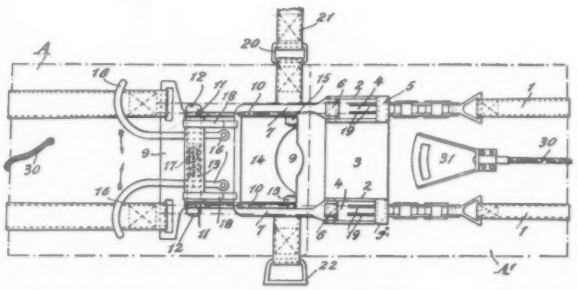
The invention further aims to provide a combined brake and tail skid.

No. 1,701,451, AIRPLANE, Patented February 5, 1929, by Randolph F. Hall and Charles Ainsley Phillips, of Ithaca, New York, Assignors, by direct and mesne assignments, of three-fourths to said Randolph F. Hall and one-fourth to Theodore P. Hall, of Wallingford, Connecticut.



A characteristic of the invention resides in a design and construction of corrugated metal skin or covering formed from long sheets for aircraft elements of the tapered or varied section forms, in which the corrugations are disposed longitudinally of an element and are constant in number and total width, and the peripheral increase in the element due to the taper or variations in section is compensated for and taken up by smooth metal skin or covering sections or areas forming part of and completing the skin or covering.

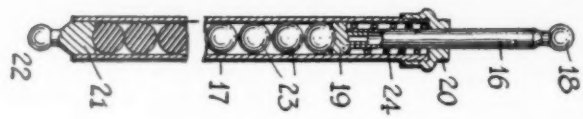
No. 1,703,001, PARACHUTE, Patented February 19, 1929, by Giuseppe Furmanik, of Rome, Italy, Assignor to Giacomo Achille Calabi, of Rome, Italy.



This invention regards particularly the attachment of the user to the vertex of the rope system of the parachute, the illustration showing the waist belt of the pilot, with its various attaching or hooking devices.

No. 1,703,222, AEROPLANE LANDING GEAR, Patented February 26, 1929, by Daniel J. Brimm, Jr., of West

Hempstead, New York, Assignor to Ireland Aircraft Inc. a Corporation of New York.



The patentee substitutes resilient spheres or balls in place of the usual rubber dises, which are generally considered when rubber in compression is used as the shock absorbing agent in landing gear shock absorbers. Preferably the spheres are completely enclosed in one of the legs or sections of a telescopic strut.

STATEMENT OF OWNERSHIP

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of Popular Aviation and Aeronautics, published monthly at Chicago, Illinois, for April 1929.

State of Illinois, } ss.
County of Cook }

Before me, a notary public, in and for the state and county aforesaid, personally appeared Harley W. Mitchell, who, having been duly sworn according to law, deposes and says that he is the editor of Popular Aviation and Aeronautics and that the following is to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

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Editor, Harley W. Mitchell, 608 S. Dearborn Street, Chicago, Ill.

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